Datalight ROM-DOS™

User's Guide

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Datalight **ROM-DOS™ User's Guide**

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Contents

Chapter 1, ROM-DOS Introduction

About ROM-DOS

ROM-DOS is a disk operating system that can be loaded in Read Only Memory (ROM) and can run entirely from within ROM and also from a hard or floppy disk, such as in a desktop system. ROM-DOS is functionally equivalent to other brands of DOS and can run programs that are executable under a standard DOS (which executes from RAM).

Conventions Used in this Manual

This manual uses several notation conventions to denote specific actions and types of information.

- Key combinations, where two or more keys must be pressed simultaneously, are shown with a plus sign. For example, Shift+F1.

- Command line entries and displayed messages are shown in `this font`. For example,

```
DEL MYLETTER.DOC
```

- Command line entries indicated by italicized lowercase letters represent information that you supply. For example,

```
DEL filename
```

  indicates a need to enter the name of the file to be deleted.

- Command line entries enclosed within square brackets represent optional information. For example,

```
ECHO [message]
```

  indicates the *message* portion may be omitted from the ECHO command.

- Command line entries that include mutually-exclusive options separate those options with a vertical bar (|). In the following example, anything more than the BREAK command must be either the `ON` or `OFF`.

```
BREAK [ON|OFF]
```

- You must press the Enter key for ROM-DOS to accept your command line data. The command line entries shown in this manual do not show the Enter key.

Terminology Used in this Manual

Computer files are stored in the computer's internal memory (RAM and ROM) or on magnetic media, typically disks. Regardless of where the files reside, all information is stored in bytes. A byte can store a single character of data. The following terms describe the size of memory, files, and disk space:

KB (kilobyte) – One kilobyte equals 1024 bytes, although the number is often rounded to one thousand bytes.

MB (megabyte) – One megabyte equals 1,048,576 bytes but is usually thought of as one million bytes.

GB (gigabyte) – One gigabyte equals 1,073,741,824 bytes but usually is thought of as one billion bytes.

TB (terabyte) – One terabyte equals 1,099,511,627,776 bytes but usually is thought of as one trillion bytes.

Random Access Memory (RAM)

RAM can be written to, read from, erased, and rewritten. RAM is your computer's electronic workspace during operation. RAM is also called volatile memory. Its' storage ability is temporary, only holding information while the power is on. When the power is turned off or interrupted, everything stored in RAM is lost.

Within limits, you can change the amount of RAM in a system. Typically, embedded systems have 512KB, 640KB, or 1MB of RAM. Greater amounts of RAM are also possible. In desktop systems, 16MB to 128MB are common.

Read Only Memory (ROM)

ROM is more permanent than RAM. Data is programmed into a ROM device before the device is installed in the computer. Information stored in ROM remains intact whether the system power is on or off.

Disks and Disk Drives

Computer disks are classified into two basic groups; rotating media such as floppy disks and hard disks, and memory disks such as those formatted in RAM, ROM and flash memory.

Floppy Disks

A floppy disk is a disk-shaped piece of magnetic material much like audio recording tape. The information is stored in concentric tracks that are subdivided into sectors. Typical storage space on the 3.5-inch disk is 1.44MB.

Hard Drives

Hard drives work similar to floppy disks but are fixed in the computer chassis and have a much higher storage capacity. ROM-DOS 6.22 is capable of utilizing hard drives of up to 8GB and ROM-DOS 7.1 is capable of utilizing hard drives of up to 2TB.

RAM Disks

Portions of RAM can be made to behave like disk drives, complete with tree-structured directories. When a disk drive is created in RAM, it can be read from and written to in the same manner as the physical disk media. However, when system power is interrupted, all information on the drive is lost, unless the drive is formatted on static RAM.

ROM Disks

Portions of ROM can be made to behave like disk drives, complete with tree-structured directories. ROM drives differ from RAM drives in that they are written to only once. Thereafter, they can only be read from, much like a write-protected floppy disk. In addition, ROM disks are non-volatile, in that the information is not lost when power is lost.

Flash Memory Disks

Both PCMCIA cards (PC cards) and on-board (resident) flash arrays can serve as disk drives when used with flash file system software such as Datalight's FlashFX for on-board flash memory. Unlike ROM disks, flash memory disks support both the reading and writing of data.

Recommended Texts

The following are all excellent texts on the topic of DOS and its internal structures. The knowledge in them applies to Datalight's ROM-DOS as well as most other DOS compatibles. These all come highly recommended by Datalight, Inc.

1. Microsoft MS-DOS Programmer's Reference
   Microsoft Press, 1993
   ISBN 1-55615-546-8

2. DOS Programmer's Reference, 4th Edition
   by Terry Dettmann, Que Corporation, 1993
   ISBN 1-56529-150-6

3. DOS Internals
   by Geoff Chappell, Addison-Wesley 1994
   ISBN 0-201-60835-9

4. Undocumented DOS, 2nd Edition
   by Andrew Schulman, Addison-Wesley, 1993
   ISBN 0-201-63287-X

5. PC Interrupts, 2nd Edition
   by Ralf Brown & Jim Kyle, Addison-Wesley 1994
   ISBN 0-201-62485-0

Chapter 2, ROM-DOS Installation

Installing and Running ROM-DOS

This chapter provides an overview of the process for installing ROM-DOS on a development system and running on a target platform. To create a version of ROM-DOS that runs on any system, follow these steps (described in detail in subsequent chapters of this manual).

- Select the hardware platform.
- Select the BIOS.
- BUILD (configure) ROM-DOS for that system.
- Create a ROM disk (required only for *diskless* systems).
- Program PROMs and install them (*diskless* systems) or sys the boot drive, and reboot.

Development System Installation Procedure

The development system is used to install the ROM-DOS files from the distribution CD-ROM and then configure and build ROM-DOS to your target system specifications as described in the following chapters.

To install the ROM-DOS SDK software on your Windows development system:

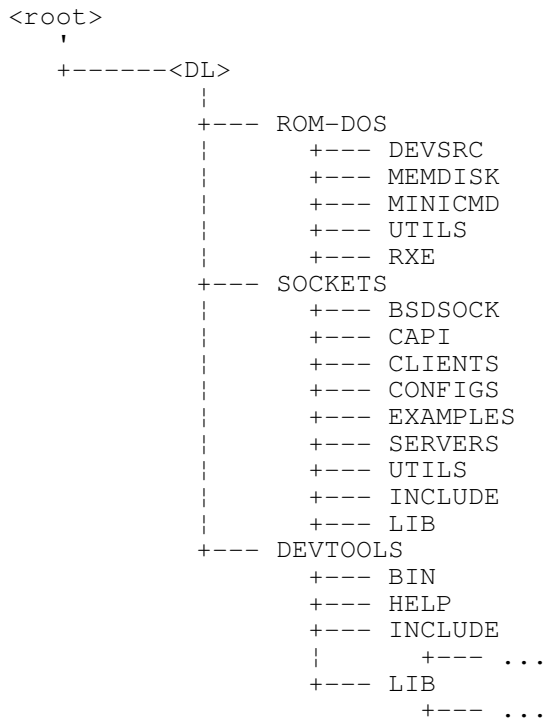
1. Place the CD-ROM in CD drive.
2. Choose Start/Run and type **setup**
3. Follow the onscreen instructions presented by the setup program to install the required components.

We strongly recommend you install all Datalight software under its own directory branch. We suggest you accept the default branch name (DL), which corresponds with the examples in this manual.

You should also install the enclosed Datalight Software Developer's Tool Kit (SDTK) in the same manner. When the installation is complete, modify your path statement to include the C:\DL\DEVTOOLS\BIN directory. This path allows the ROM-DOS BUILD utility to locate all necessary tools.

Installed Files

When installation of the ROM-DOS SDK and the SDTK software is complete, ROM-DOS and the Tool Kit software exist on your development system in the following directories/folders.



Default Directory Structure

ROM-DOS Considerations

ROM-DOS runs on most x86 hardware platforms, including the 186, 286, 386, 486 or Pentium, as well as the NEC V-series and the growing number of work-alike processors. Companies such as NEC and Vadem offer all the parts of a PC in a single piece of silicon. ROM-DOS contains no hardware dependencies.

Selecting the BIOS to use depends on the availability of a BIOS for the hardware and the ROM space requirements for the BIOS. When selecting the BIOS, consider not only the availability, but the features of the BIOS. The BIOS should recognize the basic hardware you intend to have available in your system. It is generally the responsibility of the BIOS to support PCMCIA cards (at least SRAM cards) through the BIOS disk Int 13h. The BIOS should also support extended memory on those CPUs that can address RAM beyond 1MB.

Building (or more appropriately, customizing) ROM-DOS for any given system requires a minimum of effort. Building ROM-DOS can be as simple as answering a few prompts that the BUILD program displays and then placing ROM-DOS on disk or in ROM. Chapter 4 is devoted to running the BUILD program.

When building ROM-DOS, consider such issues as which drive letters you want associated with the disk drives. Will drives A: and B: be assigned to the floppy drives, as ordered on a desktop system? Or will the ROM disk be drive A:, a PCMCIA disk drive B:, followed by floppy and hard disks? ROM-DOS makes no restrictions in this area, so choose what best suits your system. You

may need to adjust the file SYSGEN.ASM described under “Ordering Floppy and Hard Disk Drives” in the ROM-DOS Developer’s Guide to order the drive letters.

If a ROM disk is needed, either for booting, or as another disk on the ROM-DOS system, use the ROMDISK.EXE program to create this disk. A ROM disk driver that searches memory for the ROM disk is built into ROM-DOS.

If ROM-DOS will be placed in ROM, the final step is to program the ROMs and place them in the target machine. At this point, the system can be booted using ROM-DOS.

Systems running ROM-DOS directly from a hard or floppy disk do not need to program any ROMs. Simply run FORMAT and/or SYS on the disk and reboot.

Chapter 3, ROM-DOS Basics

Files, Directories, and Command Line Entries

Naming Files

A file is a defined set of related information that your computer stores electronically. A file may be stored on a floppy disk (also called a floppy), on a hard drive, on a CD, or may reside in computer memory (RAM or ROM). To maintain control of interaction between various computer files, each must have its own name that both you and the computer can recognize.

Long Filenames

Files used in the ROM-DOS environment, with long filename support enabled, can have up to 260 characters including the file extension and path. Each long filename also has a standard 8.3 filename associated with it. Long filenames can use nearly any character except the following symbols:

Output redirection	>	Question mark	?
Input redirection	<	Asterisk	*
Backslash	\	Double quotes	“
Forward slash	/	Pipe	|

When using a long filename or path that contains spaces, the name and/or path must be surrounded by double quotes. For example:

```
copy “c:\my directory\my file.doc” “c:\another directory\reference”
```

Standard 8.3 Filenames

Files used in the ROM-DOS environment, without long filenames support enabled, have two-part names separated by a period. The first part is the filename; the second part is the filename extension. For example, the command interpreter file provided with ROM-DOS is named COMMAND.COM, where COMMAND is the filename and .COM is the filename extension.

Filenames range from one to eight characters in length and consist of any combination of letters, numbers, and the following symbols:

underscore	_	Ampersand	&
Caret	^	Hyphen	-
dollar sign	$	Braces	{ }
Tilde	~	Parenthesis	( )

exclamation point	!	At sign	@
number sign	#	Apostrophe	‘
percent sign	%		

Filename Extensions

The second part of the filename is the filename extension. The filename extension has one, two, or three characters and may use the same symbols as the filename. A filename extension is not required, although filename extensions can be helpful in identifying the type of file. Commonly used filename extensions include .DOC for documents, .DAT for data, and .TXT for text files.

You may use any filename extension you choose. However, certain filename extensions have a special meaning to ROM-DOS and should only be used when appropriate. These include:

.COM – used for executable files

.EXE – used for executable files

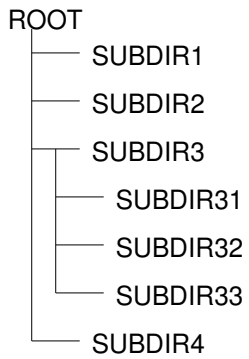
.BAT – used for batch files

Some application programs, such as word processors, may use or require particular filename extensions for output or input files. It is best to follow the application instructions regarding proper filename extensions for that particular program. For example, a file named LETTER1 may include a filename extension such as LETTER1.DOC or LETTER1.TXT.

It is possible to have several files with the same filename but different extensions. ROM-DOS searches for and accesses the filename extensions in the following order: .COM, .EXE, .BAT, and then all others. For example, you could have an executable file named MYPROG.EXE and a batch file call MYPROG.BAT in the current directory. When you enter MYPROG on the command line, the file MYPROG.EXE is executed. If you want to execute the batch file MYPROG.BAT, you must specify the .BAT extension when entering MYPROG on the command line.

Tree-Structured Directory System

ROM-DOS uses a tree-structured directory system. In this system, each branch of the directory, called a subdirectory, is either attached to the main or root directory or is attached to another subdirectory. The following diagram illustrates the directory system and shows two levels of subdirectories under the root directory.



Naming Subdirectories

You can create any subdirectory structure you choose, giving each subdirectory the name of your choice. The naming of subdirectories is similar to the naming of files. There is an eight-character limit when long filename support is disabled, and you have the same character-choice limitations as for filenames (letters, numbers, and symbols). A subdirectory name can also have an extension. For more information on creating and deleting subdirectories, refer to the MD and RD descriptions later in this manual for more information on creating and removing directories.

Moving around the Directory Tree

When the computer is first turned on, ROM-DOS boots into the root directory. From the root, you can change to any other directory by means of the CD (CHDIR) command. At any given time, ROM-DOS considers you to be in a specific directory, referred to as the current directory. You can make the computer automatically move to a different directory upon system startup by adding the CD command to your AUTOEXEC.BAT file. Refer to the description of the CD command later in this manual for more information on changing the current directory.

Drive Specifications

Since ROM-DOS can store and retrieve information from more than one disk drive, disk drives are given unique names such as A:, B:, C:, and so on. By convention, floppy disk drives are identified as drive A: and drive B:. On systems having only one physical floppy drive, ROM-DOS can treat the one drive as either A: or B:.

The hard drive, if your system has one, is identified as drive C:. Hard drives can be partitioned (divided) into smaller sections with the FDISK utility. Under DOS 6.22, disks exceeding 8GB must be partitioned into two or more areas, with a maximum size of 2GB per partition but will never use more than the first 8GB of the drive. DOS 7.1 does not have these restrictions. A separate drive letter identifies each hard-drive partition. The first partition is drive C:, the next drive D:, and so on. The highest available drive identifier is the letter Z.

To refer to the C: drive, enter the following on the command line

```
C:
```

Note: The drive name may be entered in either uppercase or lowercase.

Using Wildcard Characters without Long Filename Support

To simplify a task performed on a large group of similarly named files, use wildcard characters. Wildcard characters allow you to reference groups of files without entering the complete filename for each file in the group. A wildcard character can substitute all or part of a filename or extension. The two wildcard characters are the asterisk (*) and the question mark (?). The asterisk represents an entire name or a group of characters found within a name beyond the place where the asterisk is in the search mask. The question mark represents a single character. The following table lists some examples of wildcard character usage.

Example	Description
DIR C:\TEST*.EXE	Lists all files in the TEST directory having the extension .EXE.

Example	Description
DIR D*.*	Lists all files in the current directory that start with the letter D.
COPY C:*.BAT B:*.BAK	Copies all files with a .BAT extension from the C: drive root directory onto the B: drive. The files on the B: drive will have an extension of .BAK. This example backs up a group of files with a single command.
DIR B:\????.*	Lists all the files on the B: drive that have exactly four characters in the filename but have any extension. The question mark substitutes for a single character.
REN TEST?.BAT TEST?.OLD	Renames all files having TEST for the first four characters in the filename, followed by any single character and the .BAT extension. The files retain the same TEST? filename but gain the file extension OLD. The ? can also be used to match a single specific character in a filename.

Using Wildcard Characters with Long Filename Support

To simplify a task performed on a large group of similarly named files, use wildcard characters. Wildcard characters allow you to reference groups of files without entering the complete filename for each file in the group. A wildcard character can substitute all or part of a filename or extension. The two wildcard characters are the asterisk (*) and the question mark (?). The asterisk represents an entire name or a group of characters found within a name up to the next character in the search mask. The question mark represents a single character. The following table lists some examples of wildcard character usage.

Example	Description
DIR C:\TEST*.EXE	Lists all files in the TEST directory having the extension .EXE.
DIR C:\TEST\A*M*.EXE	Lists all files in the TEST directory having a name that begins with an A, contains an M, and has the extension .EXE.
DIR D*.*	Lists all files in the current directory that start with the letter D.
DIR D*	Lists all files in the current directory that start with the letter D.
DIR *D	Lists all files in the current directory that end with the letter D.
COPY C:*.BAT B:*.BAK	Copies all files with a .BAT extension from the C: drive root directory onto the B: drive. The files on the B: drive will have an extension of .BAK. This example backs up a group of files with a single command.
DIR B:\????.*	Lists all the files on the B: drive that have exactly four characters in the filename but have any extension. The question mark substitutes for a single character.
REN TEST?.BAT TEST?.OLD	Renames all files having TEST for the first four characters in the filename, followed by any single character and the .BAT extension. The files retain the same TEST? filename but gain the file extension OLD. The ? can also be used to match a single specific character in a filename.

System Prompt

After the execution of each command, ROM-DOS displays the system prompt indicating that it is ready for the next instruction. Unless you define the system prompt otherwise with the PROMPT command, the prompt includes only the current disk drive designation followed by a right angle bracket. For example,

```
A:>
```

One common choice for prompt line configuration is to include the current path in addition to the drive designation. For example,

```
A:\MY_FILES>
```

For more information on configuring the system prompt, refer to the PROMPT command description later in this manual.

Command Line

Your keystrokes appear to the right of the system prompt on the command line. You can use the following keys to edit the contents of the command line:

Key	Editing Function
F1	Displays one character at a time from the command line buffer. The right-pointing direction key works in the same way.
F3	Displays entire contents of command buffer.
Ins	Allows insertion of one or more characters in the command line.
Del	Allows deletion of a character from the command line buffer.
Esc	Cancels the current command line and returns you to a new, empty line.
Backspace	Deletes to the left. Allows backing up on the command line.

The last command entered on the command line is stored in a command line buffer. You can recall and edit the contents of this buffer as a way of reentering the command to repeat it or make changes to it. For example, if you intended to enter CHKDSK but accidentally entered CHKDSI, a message appears indicating that CHKDSI is a nonexistent command or filename. Rather than reentering the entire string of characters, press F3 to recall the string and use the Backspace key to back up and make the correction.

You may also make corrections to the beginning of long command line entries. For example, suppose you enter the command

```
CPY DATA1.DAT A:DATA1BAK.DAT
```

where the command is misspelled (COPY is missing the O). To correct the command line, press F1 to display the first character. Then press Ins followed by O.

You can now enter the rest of the command by pressing F3 once.

Redirecting Input and Output

Certain conventions dictate where each ROM-DOS command receives input data and where it sends output data. However, by using the right angle bracket (>) and the left angle bracket (<), you can redirect the input and output.

Input Redirection

The syntax for changing standard input source from keyboard input to file input is

< *filename*

When this is added at the end of the command line, ROM-DOS receives its instructions from the file named *filename*.

Caution: If input redirection is used and the input file is incomplete, the system will hang and refuse to accept information from the keyboard (except for Ctrl+Alt+Del to reboot).

Output Redirection

The syntax for redirecting output to a file is

> *filename*

When this is added to the end of the command line, standard output is temporarily directed to the file named *filename*. If the named file already exists, its contents are replaced with the ROM-DOS function's output. Otherwise, a new file is created to hold the output. Output can also be redirected to a device such as PRN (the printer).

To append output to the receiving file, rather than replace its contents, use >>.

>> *filename*

This adds the ROM-DOS function's output to the existing contents of the named file. If the named file does not exist, ROM-DOS creates the file.

For example, if you want to save a list of the current directory contents to a file, you can redirect the DIR command's output to a file by entering:

```
DIR > MYDIR.TXT
```

where MYDIR.TXT is the name of the file you want to contain the directory listing.

Using Batch Files

A batch file is a standard text file containing a list of commands that can be submitted to ROM-DOS for automatic sequential execution. Using batch files helps you avoid unnecessary retyping of command sequences that are commonly repeated, complex, or difficult to remember.

The ROM-DOS command processor provides full batch file processing, compatible with standard DOS version 6.22, DOS version 7.1, and Windows 98 DOS box long filename support. Batch files can include internal DOS commands, external DOS commands, batch file commands, names of other executable files or programs, or even the names of other batch files.

Batch Filenames

When naming batch files, use the .BAT extension on the filename. This extension tells ROM-DOS to execute the batch file when its name is entered on the command line. The name of the batch file cannot be the name of other internal commands. For example, COPY.BAT is an invalid batch filename.

To execute the batch file, enter the filename on the command line. You need not include the .BAT extension unless a file with the same filename and a .EXE or .COM extension is present in the same directory. Batch file execution begins when you press the Enter key.

Creating a Batch File

You can create a batch file by using any word processor or text editor that saves output as unformatted (ASCII) text. Or you can create them by typing directly from the keyboard into a file. This is done with the command

```
COPY CON filename.BAT
```

This tells ROM-DOS to copy the output from the console (keyboard) to the specified file. Once you have entered the above command, you may enter the contents of your batch file.

At the completion of each line, press Enter. As you enter each line, you can make corrections using Backspace and retyping. If you enter an incorrect line or wish to discontinue without saving your work, press Ctrl+C.

When you have finished entering all the lines in your batch file, press Ctrl+Z and then Enter to complete the file and return to the command line prompt.

Batch File Command Line Parameters

A batch file may use parameters placed on the command line. Insert these parameters as arguments for commands or instructions within the batch file. For example, the following batch file, named ARCHIVE, accepts a command line parameter:

```
PRINT %1
COPY %1 \ARCHIVE\*.*
DEL %1
```

Execute the ARCHIVE batch file by entering

```
ARCHIVE THISFILE.DAT
```

The %1 parameter takes on the name THISFILE.DAT, and the batch file executes the following to make a copy of THISFILE.DAT in the ARCHIVE subdirectory:

```
PRINT THISFILE.DAT
COPY THISFILE.DAT \ARCHIVE\*.*
DEL THISFILE.DAT
```

Note: %1 represents the first parameter in a batch file command. If a command has multiple parameters, they are represented by %2, %3, and so on.

Batch File Commands

In addition to the standard ROM-DOS commands, there are other commands specifically for batch files. Refer to CALL, CHOICE, ECHO, FOR, GOTO, IF, PAUSE, REM, and SHIFT later in this manual for more information on these commands.

For example, you may often run a program named MY_INFO1 followed by a program named MY_INFO2, both of which display a screen of information. After running each of these programs, you always clear the screen before proceeding. Your normal keystroke sequence is:

```
MY_INFO1
CLS
MY_INFO2
CLS
```

You could create a batch file named INFO containing the following commands:

```
MY_INFO1
PAUSE
CLS
MY_INFO2
PAUSE
CLS
```

After executing MY_INFO1 (by entering INFO on the command line), the system pauses. When you press a key, the batch file clears the screen and executes MY_INFO2, then pauses again. Press a key to return to the command line.

Note: You can bypass some or all of the commands in your AUTOEXEC.BAT files during system boot. Refer to "**Bypassing CONFIG.SYS and AUTOEXEC.BAT Commands**" on page 26

ROM-DOS Command Summary

Following are brief descriptions of all ROM-DOS and SOCKETS commands, including batch file commands.

Command	Description	Location
?	CONFIG.SYS command. It directs ROM-DOS to pause for confirmation before processing a command.	Page 35
@	Used to suppress the display of a single batch-file command line.	Page 36
;	Identifies nonexecuting lines. The same as the REM command.	Page 37
ANSI.SYS	A console device driver that allows you to support ANSI codes on the local screen.	Page 81
ATA.SYS	A PCMCIA ATA disk device driver.	Page 82
ATTRIB	Displays or modifies the attributes associated with a file.	Page 83
BACKUP	Backs up a single directory tree to a floppy drive, hard disk, or network drive.	Page 84
BREAK	Turns on or off the ability to stop program execution at a non-I/O point.	Page 37
BUFFERS	Sets the number of internal data buffers.	Page 38
CALL	Batch file command. Invokes execution of a secondary batch file.	Page 39
CHDIR (also CD)	Changes the current directory.	Page 40
CHKDSK	Checks the integrity of data on a disk. Displays information.	Page 85
CHOICE	Allows a user to make a processing choice during the execution of a batch file.	Page 86
CLS	Clears all information from the monitor's screen.	Page 41
COMM	ANSI terminal program.	Page 87
COMMAND	Starts a second DOS command processor.	Page 90
COPY	Copies files from one storage location to another.	Page 41
COUNTRY	Designates the country code for displays.	Page 28
CTTY	Changes the default terminal interacting with ROM-DOS.	Page 44
DATE	Displays and allows you to change the date from the system's internal calendar.	Page 45
DEL	Deletes specified files.	Page 46
DELTREE	Deletes one or more directory trees or individual files.	Page 91
DEVICE	Installs a device driver into ROM-DOS.	Page 47
DEVICEHIGH	Loads a device into the upper memory area, if available.	Page 47
DIR	DIRectory. Lists contents of a specified directory.	Page 48
DISK2IMG	Creates an image of a drive or disk.	Page 92

Command	Description	Location
DISKCOPY	Copies the contents of one floppy disk to another of the same type.	Page 93
DISPLAY	Displays international letters and symbols.	Page 94
DOS	Installs ROM-DOS into High Memory Area (HMA).	Page 50
DUMP	Shows contents of memory or a file in hex and ASCII format to the display.	Page 95
ECHO	Batch file command. Displays (on) or hides (off) commands executed from a batch file.	Page 51
EGA/EGA3.CPI:	Font data files for use with the international video display driver, DISPLAY.SYS.	Page 95
EMM386	Enables expanded memory support for capable systems.	Page 96
ERASE	Erases specified files (same as DEL).	Page 52
EXE2BIN	Converts a DOS .exe file to a .com file.	Page 98
EXIT	Used to exit nested running of ROM-DOS within another program.	Page 53
FCBS	Specifies the number of File Control Blocks (FCBS) open at one time.	Page 53
FDISK	Initializes and partitions a hard disk for DOS.	Page 99
FILES	Sets the maximum number of files that can be open at one time on the system.	Page 54
FIND	Works as a filter to display only lines that contain a specified string.	Page 100
FOR	Batch file command. Performs one DOS command on a set of files.	Page 54
FORMAT	Initializes a disk so that ROM-DOS can access files on that disk.	Page 101
GOTO	Batch file command. Moves control to a specified line in the batch file.	Page 55
HELP	Lists all available ROM-DOS commands along with brief descriptions.	Page 55
HIMEM	Manages extended memory and the high memory area on a system that is 286 or greater.	Page 102
IF	Batch file command. Performs a command based on a specified condition.	Page 56
INCLUDE	Allows instructions in one configuration block to be included with instructions in another configuration block.	Page 57
INSTALL	Loads Terminate and Stay Resident (TSR) programs during CONFIG.SYS processing.	Page 5
KEYB	Allows altering of the keyboard layout for a different language or nationality.	Page 104

Command	Description	Location
KEYBOARD/ KEYBRD2.SYS	Keyboard code page data files for use with the international keyboard driver, KEYB.COM.	Page 105
LABEL	Creates, changes, or deletes a disk volume label.	Page 105
LASTDRIVE	Sets the maximum number of drives.	Page 58
LFNFOR	The LFNFOR command enables/disables long file names when processing FOR commands.	Page 59
LOADHIGH	Loads a program into the upper memory area, if available.	Page 59
MEM	Displays the used and free memory in your system.	Page 106
MENUCOLOR	Allows setting of text and background colors for the startup menu.	Page 60
MENUDEFAULT	Sets the default menu-item choice and time-out value for making a selection.	Page 61
MENUITEM	Specifies an item to be placed on the startup menu display during system boot.	Page 62
MKDIR (also MD)	Creates a new subdirectory.	Page 63
MODE	Modifies the operation of the printer, serial port, and active video display.	Page 106
MORE	Displays a text file one screen at a time.	Page 108
MOVE	Moves files and renames files and directories.	Page 108
MSCDEX	Enables the use of CD-ROM drives.	Page 109
NED	A DOS text editor.	Page 110
NEWFILE	Allows continuation of CONFIG.SYS processing from a new file.	Page 64
NUMLOCK	Sets the NUMLOCK key to on or off when your computer starts.	Page 65
PATH	Displays current command search path(s). A new path line can be specified.	Page 65
PAUSE	Batch file command. Causes execution to halt until a key is pressed.	Page 66
POWER	Conserves power on the system that employs an APM BIOS.	Page 115
PRINT	Prints a list of up to ten files.	Page **Error! Bookmark not defined.**
PROMPT	Resets the appearance of the system prompt line.	Page 67
PROTO	PROTO creates function prototypes in C language files	Page 117
REM	Batch file command for identifying non-executing lines.	Page 68
REMDISK	Remote Disk client.	Page 139

Command	Description	Location
REMSERV	Remote Disk server.	Page 139
REMQUIT	Terminates Remote Disk server.	Page 140
REN	Renames files.	Page 69
RESTORE	Restores files previously saved with BACKUP to the hard disk.	Page 118
RMDIR (also RD)	Deletes a specified subdirectory.	Page 69
RSZ	Zmodem file transfer utility.	Page 119
SET	Sets environment variables and command processor strings.	Page 70
SHARE	Installs the capabilities for file sharing and file locking on your hard disk.	Page 121
SHELL	Allows selections of a command interpreter other than COMMAND.COM.	Page 71
SHIFT	Batch file command. Shifts replaceable parameters one position to the left.	Page 72
SMARTDRV	Disk Caching utility for hard & floppy disks, CD-ROM and other devices.	Page 122
SORT	Utility that sorts text files and displays the output to the standard device.	Page 123
STACKDEV	Increases the number of stacks available for IRQ handlers and Int13h.	Page 124
STACKS	Allows for the use of dynamic data stacks to handle interrupts.	Page 73
SUBMENU	Defines a menu item that represents a secondary menu.	Page 73
SUBST	Allows one drive to appear as another drive.	Page 125
SWITCHES	Allows special CONFIG.SYS file options.	Page 74
SYS	Transfers the hidden system files to a specified drive.	Page 125
TIME	Displays and allows you to change the current time from the system's internal clock.	Page 75
TRANSFER	File transfer utility.	Page 126
TREE	Displays the path of each directory on a specified drive.	Page 128
TYPE	Displays the contents of a text file.	Page 77
UMBLINK	A non-protected mode program that can allow the creation of Upper Memory Blocks using existing RAM areas.	Page 129
VDISK	Allows the use of memory as a simulated disk driver.	Page 130
VER	Displays current version of ROM-DOS.	Page 78
VERIFY	Displays the current VERIFY state or sets the VERIFY state to on or off.	Page 78
VOL	Displays the volume label on a disk.	Page 79
XCOPY	Copies multiple files and, optionally, subdirectories.	Page 131

Chapter 4, ROM-DOS Configuration

Basic Configuration

Certain standard settings for your system's operation can be stored in a file named CONFIG.SYS. You may create or edit your own CONFIG.SYS file using a word processor or the COPY CON command. (See "**Creating a Batch File**" on page 16.)

You must place the CONFIG.SYS file in the root directory of the drive that is used for system startup or boot. If a CONFIG.SYS file is not found, the following default values are used for the following commands:

```
BREAK = OFF
BUFFERS = 15
COUNTRY = 001
FCBS = 4
FILES = 8
NUMLOCK = ON
SHELL = COMMAND.COM /P /E:128
STACKS = 0,0
```

Example

A typical CONFIG.SYS file might look like this.

```
BREAK = ON
FILES = 15
BUFFERS = 15
DEVICE = C:\ROMDOS\HIMEM.SYS
```

Using Multiple-User Configurations

Your CONFIG.SYS file can be used to define multiple system configurations. This is handy when several people share a computer and require different working environments. It is also useful for booting your own computer using different device drivers, paths, or settings, depending on the intended computer tasks.

To define multiple configurations within the CONFIG.SYS file, you first need to define a startup menu. Each menu item represents a different system configuration option. Then, for each item on the menu, define a configuration block. Each configuration block contains the specific commands to be implemented as the system completes booting.

The menu-item definition and all configuration blocks are marked with a block header. A block header is a descriptive label enclosed in square brackets ([ ]). The start of the menu items must be marked with the block header [MENU]. Each configuration block may have a unique label of your choice. This label can be up to 70 characters long and can contain most printable characters, including spaces, backslashes (\), forward slashes (/), commas (,), semicolons (;), and equal signs (=). Square brackets ([]) cannot be used in block names.

The menu block (or submenu block) may contain only the following commands (a full description for each command can be found in the Command Descriptions section in Chapter 5):

- MENUITEM
- MENUDEFAULT
- MENUCOLOR
- SUBMENU
- NUMLOCK

Note: Although NUMLOCK may be used outside of a menu/submenu block, it is typically used to enable the keypad for menu-choice selections in the menu block.

A sample menu block might look as follows:

```
[MENU]
menuitem=Research, Research and Development
menuitem=WP, Word Processing
menuitem=Games, Games
menucolor=8,5
menudefault=WP, 10
```

When the system boots, the following menu displays

```
ROM-DOS 6.22 Startup Menu
1. Research and Development
2. Word Processing
3. Games
Enter a choice: 1
```

Each menu item has its own configuration block. Items that are common to all menu choices can be placed in a Configuration Block labeled [COMMON]. All instructions in the common block are carried out along with the specific instructions for any menu item. The [COMMON] block can also be placed at the end of your CONFIG.SYS file so that applications can append commands into this area as the application installs. You may have as many common blocks as you want. The instructions found in the common block(s) are processed in the order they are listed in the CONFIG.SYS file.

When the CONFIG.SYS file is processed by ROM-DOS, it first displays the startup menu that was defined in the [MENU] configuration block, and then waits for your response. The choice made from the menu determines the configuration block whose commands are to be executed. After the menu selection, processing starts with any instructions in CONFIG.SYS prior to the menu block. Then, instructions in the selected configuration block (including instructions added in via an INCLUDE statement) and all common blocks are processed in the order they are listed in CONFIG.SYS. ROM-DOS ignores the instructions in any nonselected configuration blocks or submenus.

To continue the above example, the configuration blocks might appear as follows:

```
[COMMON]
device=c:\romdos\himem.sys
dos=high
```

```
break=on
[RESEARCH]
files=20
buffers=50
device=vdisk.sys 128 /e
[WP]
files=10
buffers=10
lastdrive=m
device=c:\network\loadnet.sys
[GAMES]
include=wp
device=mouse.sys
[COMMON]
```

If choice number 3 is made, selecting [GAMES], the instructions in the [COMMON] configuration block are processed first, followed by the instructions in the [GAMES] configuration block. The [GAMES] section makes use of the INCLUDE command. All of the instructions provided for the WP menu choice also apply to [GAMES]. If any instructions are in the final [COMMON] configuration block, they are processed last.

Extending Menu Items to AUTOEXEC.BAT

The defined name of the menu item you have chosen becomes the value of the environment variable CONFIG. For example, if you choose number 3, GAMES, from the preceding menu, the variable CONFIG is set to GAMES. The CONFIG environment variable can then be used in your AUTOEXEC.BAT file to further customize the startup sequence. This environment variable is referenced by %CONFIG% in your AUTOEXEC.BAT file.

An example of an AUTOEXEC.BAT file that continues the customization process from the preceding MENU may look like this.

```
prompt $p$g
set temp=c:\mystuff\temp
c:\virus\scanit.com
rem Go to section that matches menu
rem choice made in CONFIG.SYS
goto %config%
:RESEARCH
path c:\bin;c:\ROMDOS;c:\ROMDOS\utils;c:\BORLANDC
cd \ROMDOS
rem Skip other sections and move to end
goto end
:WP
path c:\bin;c:\ROMDOS;c:\wp
wp
rem Skip next section and move to end
goto end
:GAMES
path c:\bin;c:\ROMDOS;c:\gamedir
cd \gamedir
gamelist.bat
goto end
:end
```

Bypassing CONFIG.SYS and AUTOEXEC.BAT Commands

ROM-DOS offers the capability to bypass some or all of the commands in your AUTOEXEC.BAT and CONFIG.SYS files during the boot process. This feature may be useful in tracking system problems that may be related to one or more commands in either of these two files.

To bypass the instructions in both your AUTOEXEC.BAT and CONFIG.SYS files, follow these steps:

1. Turn on, or restart your computer if it is already on, and wait for the following message.
   ```
   Starting ROM-DOS...
   ```
2. As the above message is being displayed, press the F5 key or hold down the SHIFT key to display the following message.
   ```
   ROM-DOS is bypassing your CONFIG.SYS and AUTOEXEC.BAT files.
   ```

Your system then continues the boot process using the basic default configurations. You may notice a difference in the way your system behaves. For instance, installable device drivers and memory device drivers are not loaded, and system prompts and paths have default values. If the command interpreter COMMAND.COM is not in the root directory, ROM-DOS may not be able to locate it.

Stepping Through CONFIG.SYS and AUTOEXEC.BAT Commands

If you suspect that one or more commands in either the CONFIG.SYS or AUTOEXEC.BAT files are causing problems in your system, you can choose to process or bypass each command as follows:

1. Turn on, or restart your computer if it is already on, and wait for the following message.
   ```
   Starting ROM-DOS...
   ```
2. As the above message is being displayed, press the F8 key to display the first command in the CONFIG.SYS file.
3. For each command, ROM-DOS displays a [Y,N]? prompt. To process the instruction, press Y. To bypass the instruction, press N. ROM-DOS then moves to the next command in the CONFIG.SYS file. To bypass the confirmation prompt for the remaining instructions in the CONFIG.SYS file and skip the AUTOEXEC.BAT file, you can press the F5 key at any [Y,N]? prompt.

Note: You can prompt for a single CONFIG.SYS command by using the question mark (?) command prior to the equals sign (=) in the command line. For a complete description of each CONFIG.SYS command, refer to the internal Command Descriptions starting on page 35.

When ROM-DOS finishes all of the commands in the CONFIG.SYS file, it prompts with:

```
Process AUTOEXEC.BAT [Y, N]?
```

Press Y to selectively process the commands in AUTOEXEC.BAT, otherwise press N to bypass all commands in the AUTOEXEC.BAT file.

Environment Variables

A block of system memory is reserved for the definition of certain strings, called environment variables, to be used in the command processor environment. These include the settings you may establish with the PATH and PROMPT commands as well as COMSPEC, which is automatically defined by ROM-DOS at system startup. Environment variables may be defined using the SET command that is explained in the Command Descriptions section in chapter 6.

Configuring ROM-DOS for International Use

You can configure ROM-DOS to conform to local conventions for date, time, and currency formats by giving the COUNTRY= command. You can also use the COUNTRY command to select an international character set (known as a code page) that determines the sort order. Any code page can also be shown on EGA and VGA displays by loading DISPLAY.SYS. You can remap a keyboard to provide support for various languages and layouts by running KEYB.COM.

ROM-DOS uses a country code to identify the country conventions that are to be used. In most cases, the country code is the same as the international long distance telephone dialing code.

A code page is a set of 256 symbols, including letters, digits, punctuation, and graphic characters. The first 128 symbols in a code page are the standard ASCII characters and are identical in all code pages. The last 128 symbols vary depending on the code page. These symbols include the graphic, line-drawing characters, plus many international letters, currency symbols, and other assorted symbols. A number, such as 437 identifies each code page.

A computer display has one hardware code page built into it. Typically, this is code page 437, which is the standard US code page. CGA and monochrome monitors can only display the hardware code page in text mode. EGA and VGA monitors display the hardware code page unless you load special software (like DISPLAY.SYS). Each country supports a default code page and an alternate code page. The following table lists the valid combinations.

Country	Code	Code Page	Alternative Code Page
Australia	061	437	850
Belgium	032	850	437
Brazil	055	850	437
Canadian-French	002	863	850
Czech Republic	042	852	850
Denmark	045	850	865
Finland	358	850	437
France	033	850	437
Germany	049	850	437
Hungary	036	852	850
Italy	039	850	437
Japan	081	932	---

Country	Code	Code Page	Alternative Code Page
Latin America	003	850	437
Netherlands	031	850	437
Norway	047	850	865
Poland	048	852	850
Portugal	351	850	860
Russia	007	437	866
Spain	034	850	437
Sweden	046	437	850
Switzerland	041	850	437
United Kingdom	044	437	850
United States	001	437	850
Yugoslavia	038	852	850

Changing Country Conventions

The command to instruct ROM-DOS to use German conventions, for example, is

```
COUNTRY=049
```

The COUNTRY= command requires COUNTRY.SYS to be present in the root directory of the boot drive. Setting a country code affects

- Date and time formats
- The symbol used to denote currency

If you only specify a country code, ROM-DOS uses the default code page for that country. You can choose the alternate code page by including it in the COUNTRY= command. This command tells ROM-DOS to use German conventions for things such as date and time but using code page 437 instead of 850, the default code page.

```
COUNTRY=049,437
```

Setting a system code page affects

- The sort order for alphabetizing
- The rules for converting international letters to uppercase

The individual application programs determine whether they make use of these conventions. For example, DOS uses the date format for displaying directories and for showing and getting the current date and time. Some programs may choose to ignore the country information and continue to display dates in a specific format.

Displaying Different Code Pages

To display a code page other than the hardware code page, you must load DISPLAY.SYS in CONFIG.SYS. The following command sets the display to show code page 850, assuming both the DISPLAY.SYS driver and the EGA.CPI font file are located in the C:\DOS directory:

```
DEVICE=C:\DOS\DISPLAY.SYS 850 C:\DOS\EGA.CPI
```

The available font files are named EGA.CPI and EGA3.CPI. They are both used for EGA and VGA systems.

If you have an EGA or VGA system, the character fonts are immediately switched to the requested code page. Some characters may look different after you load DISPLAY.SYS because ROM-DOS uses its own font for all 256 characters. For example, your hardware font might use a square-like zero character, but ROM-DOS might use a round zero character. The differences are minor.

Printing Different Code Pages

At this time, ROM-DOS does not support printing code pages other than those stored in the printer hardware.

Changing the Keyboard Layout

To alter the keyboard layout, issue the KEYB command from within DOS. You can do this by running KEYB in AUTOEXEC.BAT or directly from a DOS prompt. Use this following command to switch to a German keyboard layout, for example:

```
KEYB GR
```

Most countries have two valid code pages. If you do not specify a code page, the default code page is used. The following table lists the valid combinations.

Country	Country Identifier	Code Page	Alternate Code Page
Belgium	be	850	437
Canadian-French	cf	863	850
Czech Republic	cz	850	852
Denmark	dk	850	865
France	fr	437	850
Germany	gr	437	850
Italy	it	437	850
Latin America	la	850	437
Netherlands	nl	437	850
Norway	no	850	865
Poland	pl	850	852
Portugal	po	850	---
Russia	ru	437	866
Spain	sp	850	437
Sweden	sv	437	850

Country	Country Identifier	Code Page	Alternate Code Page
Swiss French	sf	850	437
Swiss German	sg	850	437
United Kingdom	uk	437	850
United States	us	437	850
Yugoslavia	yu	850	852

After you have loaded KEYB, your keyboard layout reflects the country you chose. You can switch back to the US keyboard layout at any time by pressing Ctrl+Alt+F1 (Alt+Left-Shift from Russian and Czech Republic keyboards). You can return to the modified keyboard layout by pressing Ctrl+Alt+F2 (Alt+Right-Shift from Russian and Czech Republic keyboards). You can also switch to a completely different layout by running KEYB again and specifying another country identifier.

Appendix G includes diagrams of the different keyboard layouts. The diagrams show native-language keyboards that tend to have different layouts from US keyboards. KEYB does its best to map the available hardware keys to the desired layout. Some symbols may not be available when using a US keyboard and a non-US layout. In the diagrams, symbols appearing in the lower right corner of a key are activated by pressing the AltGr key along with the desired key. On keyboards without a right AltGr, pressing Ctrl+Alt represents the AltGr key.

Note: The AltGr key is not found on a standard US keyboard.

Some keys are prefix keys that don't generate any symbol by themselves but modify the following keystroke. For example, on most European keyboards, the apostrophe key (') causes the next letter to be accented. To produce an apostrophe alone, press the apostrophe key followed by the space bar. Other keys that may behave as prefixes, depending on the current keyboard layout, are the backward apostrophe (`), tilde (~), and caret (^).

Some keys represent symbols that are not available in all code pages. For example, the German keyboard can produce a capital A with a caret above it. In the default German code page (850), that symbol is represented by the code 182. However, in the alternate German code page (437) there is no such symbol. If you are using the German layout and code page 437, and you try to produce a capital A with a caret above it, you get a caret character followed by an uppercase A (^A).

Note that the keyboard code page could be set to *not* match the display code page. This can lead to confusion, as the keyboard may produce characters that appear on screen as other symbols. Continuing the above example, if you are using the German layout with keyboard code page 850, but your display code page is 437, and you produce an uppercase A with a caret above it, the screen displays a box drawing character.

Configuring Your System: an Example

To completely configure your system, you need to include commands in your CONFIG.SYS and AUTOEXEC.BAT files. The following sample files set up a computer to use German conventions; to use code page 850 for sorting, uppercase conversions, and the display; and to

switch the keyboard layout to German. COUNTRY.SYS is assumed to be in the root directory of the boot drive, and DISPLAY.SYS, EGA.CPI, KEYB.COM, and KEYBOARD.SYS are assumed to be in the C:\DOS directory.

CONFIG.SYS

```
BUFFERS=20
FILES=20
COUNTRY=049
DEVICE=C:\DOS\DISPLAY.SYS 850 C:\DOS\EGA.CPI
```

AUTOEXEC.BAT

```
@ECHO OFF
PROMPT $P$G
PATH C:\DOS;C:\UTILITY
KEYB GR
```

Chapter 5, ROM-DOS Internal Commands

Internal Command Descriptions

The following pages provide a complete description of each ROM-DOS internal command, including batch file commands. Each entry includes a description of the command's purpose, command entry syntax, remarks, and examples as appropriate. *Internal* commands are part of the command processor program COMMAND.COM. These functions are only available while COMMAND.COM is running.

For on-line help information and syntax descriptions, use the /? option with any command. For example:

```
DIR /?
```

Note: The file COMMAND.HLP must be available in the root directory on the boot drive to access help information for internal commands.

?

The question mark (?) command directs ROM-DOS to pause and ask for confirmation before processing the command. Place it on a command line in the CONFIG.SYS file following the actual command.

Syntax

[command]? = *command_arguments*

Remarks

The *command* can be any of the following standard CONFIG.SYS commands.

BREAK=	BUFFERS=
DEVICE=	FCBS=
DOS=	INSTALL=
FILES=	LASTDRIVE=
STACKS=	SWITCHES=

command_arguments can be any of the available options defined for the command. Refer to the individual command description for complete instructions.

The question mark (?) should be placed just before the equal sign (=) in the command line.

Example

DEVICE?=VDISK.SYS 64 /E

Causes ROM-DOS to pause and ask for confirmation before installing the VDISK. If Yes (Y) is answered, the installation will continue. If No (N) is answered, the device will not be loaded and processing moves on to the next CONFIG.SYS command line.

@

Internal Command

The @ sign command prevents a single command in a batch file from being echoed to the screen as the batch file is being run. Place the @ sign in front of the command whose display is to be suppressed.

Syntax

@ [batch file command]

Remarks

The *batch file command* argument can be any executable line in your batch file.

Examples

```
@COPY FILE1.BAT FILE1.SAV
```

Executes the COPY instruction, but the instructions are not echoed to the screen as the batch file runs.

```
@ECHO OFF
```

The ECHO OFF command differs from the @ sign in that it causes all subsequent commands *not* to be displayed on the screen. To prevent the ECHO OFF command from displaying itself, place the @ sign in front of the command.

;

Internal Command

The semicolon (;) command has two purposes: to allow comments in a batch or CONFIG.SYS file, and to temporarily disable a command without physically deleting the command from the file. Refer also to the REM command.

Syntax

; *[any text here]*

Remarks

Use the (;) command to functionally remove a command from the CONFIG.SYS file without actually deleting it from the CONFIG.SYS file.

Examples

```
;C:\BIN\VDISK.SYS 64 /E
```

Prevents the VDISK command from executing until the (;) command is removed.

BREAK

Internal Command

The BREAK command expands the list of operations that can be stopped by pressing Ctrl+C or Ctrl+Break. Alternatively, returns to the default setting of a limited number of break-able operations.

Syntax

BREAK [ON|OFF]

Remarks

In the normal default condition, the BREAK switch is off. In the off mode, the stop commands, Ctrl+C and Ctrl+Break, affect activities that read from or write to the keyboard, the screen, or the printer. ROM-DOS does not look for these stop commands during any other activities.

With the BREAK switch set to ON, ROM-DOS looks for Ctrl+C and Ctrl+Break during activities such as disk reads and writes.

Examples

```
BREAK ON
```

Expands the BREAK list.

```
BREAK OFF
```

Returns to limited BREAK list.

```
BREAK
```

Displays the current BREAK setting.

BUFFERS

CONFIG.SYS Command

ROM-DOS has internal buffers to temporarily hold data read from the disk. Increasing the number of internal buffers speeds system performance.

Syntax

`BUFFERS =` *number*

Remarks

Each buffer used by ROM-DOS requires 512 bytes of RAM. The BUFFERS command increases or decreases the amount of RAM used by the operating system.

The minimum *number* of buffers is two, and the maximum number is 40. When the number is less than two, the number of BUFFERS is set to two. When the number is larger than 40, then BUFFERS is set to 40. The default number of buffers is calculated using a scale. The ratio is 15 to 640KB. Consequently, a system having 640KB of conventional memory will have 15 buffers. If the calculated number is less than two, then two buffers is used.

Example

```
BUFFERS = 10
```

This command tells ROM-DOS to create ten buffers. These ten buffers use 5120 bytes of RAM.

CALL

Batch File, Internal Command

The CALL command invokes execution of a secondary batch file without exiting the primary batch file. When the secondary batch file is done executing, control is returned to the primary batch file.

Syntax

CALL *batchfile* [*batchfile arguments*]

Remarks

Parameters for the secondary batch file may also be included, if appropriate.

Examples

```
CALL BATCH2
```

Executes the batch file BATCH2.BAT.

```
CALL MYBATCH FILEX FILEZ
```

Executes the batch file MYBATCH.BAT. The arguments passed to MYBATCH.BAT are

```
%1 = FILEX
%2 = FILEZ
```

CHDIR (CHange DIRectory)

Internal Command

The CHDIR command changes the current directory.

Syntax

CHDIR [*drive*:][*path*]*subdir*

CD [*drive*:][*path*]*subdir*

Remarks

S*ubdir* is the name of the new current subdirectory. You may use CD in place of CHDIR.

The new directory that is to become the current directory must already exist. Refer to MKDIR for information on the creation of subdirectories.

A series of two periods (..) may be used to indicate a move back to the next-higher or parent directory.

Specifying only the backslash (\) for the *subdir* argument moves you to the root directory of the current drive.

Examples

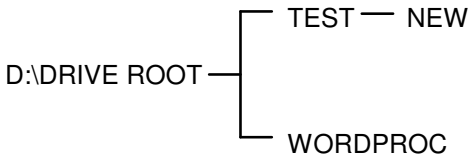
```
CHDIR \TOOLS
```

Moves you into the subdirectory named TOOLS, whose parent directory is the root of the current drive.

```
CD A:
```

This command does not move you the A: drive, it displays the current directory on drive A:. Any valid drive letter can be substituted to get the current directory on that drive.

The following examples use this directory tree structure:




```
CD D:\TEST\NEW
```

Moves you into the subdirectory named NEW, located on the D: drive, under the parent directory TEST.

```
CHDIR ..
```

Moves you back to the parent directory of the current subdirectory. If you were in the directory D:\TEST\NEW (from the previous example), this CHDIR command moves you from NEW back into the TEST directory.

```
CD ..\WORDPROC
```

Moves you back to the parent directory and then into a subdirectory named WORDPROC. If you start in the TEST directory, you will move back to the ROOT directory and then into the WORDPROC subdirectory.

```
CD \
```

Moves you back to the root directory from any starting point in the directory tree.

CLS (CLear Screen)

Internal Command

The CLS command clears the monitor to display a blank screen.

Syntax

```
CLS
```

Remarks

CLS clears the screen, and then redisplays the DOS prompt and cursor in the upper left-hand corner. There are no additional options for CLS.

COPY

Internal Command

The COPY command copies a file or set of files to a specified destination: another disk, another subdirectory on the current disk, or on a completely different drive. COPY may also be used to alter the *filename* within the current directory. In addition, this command can be used to direct communication between files and devices (for example, file contents to a printer or keyboard input to a file).

Syntax

This command has several possible formats. The essential structure of each command is

COPY source target option

The *source* is the copy from *filename* or *device*, and the *target* is the copy to *filename* or *device*. Following are various configurations of the COPY command format.

COPY [*drive:*] [*path*] *filename* [*/option*] [*drive:*] [*path*] *filename* [*/option*]

Where the first *filename* indicates the source file(s) to be copied, and the second *filename* indicates the target area on which to copy.

COPY [*drive:*] [*path*] *filename* [*/option*] + [*drive:*] [*path*] *filename* [*/option*]
[*drive:*] [*path*] *filename* [*/option*]

As shown, several source *filenames* may be listed to be copied into the target *filename* that is listed last. The source files are concatenated into the target file.

COPY [*drive:*] [*path*] *filename* [*/option*] *device*

The target *device* is a console or printer (PRN).

COPY *device* [*drive:*] [*path*] *filename* [*/option*]

The *device* is the source such as a keyboard or console, the output of which is directed to the target *filename*.

Options

The /A and /B options represent ASCII and binary, respectively, and act as switches that allow each of these file types to be copied. When /A or /B is used, it applies to the preceding *filename*. The option remains in effect for any *filenames* following in the command line until superseded by another /A or /B.

/A and /B options are only needed when combining ASCII and binary files.

/A treats the file as an ASCII file (text file). When used with the source file, everything is copied up to, but not including, the first CTRL+Z end-of-file marker. When /A is used on the target file, a Ctrl+Z is added as the last character in the file.

/B treats the file as a binary file. When /B is used with the source file, the entire file is copied regardless of any Ctrl+Z characters. When /B is used with the target filename, no Ctrl+Z end-of-file marker is added.

/H copies hidden files.

/V is not implemented in ROM-DOS for code size reasons. It is included to maintain command-line compatibility.

/Y copies the current file(s) over the existing file(s) of the same name(s) without confirmation. This option overrides the setting made by the COPYCMD environment variable.

/-Y confirms the copy of one file over the existing file of the same name. This option overrides the setting made by the COPYCMD environment variable.

Set the COPYCMD environment variable with the SET command. This allows you to set confirmation on or off for the COPY command. If you always want to be prompted for confirmation when a file will copy over an existing file, set COPYCMD= /-Y. To automatically overwrite without confirmation during a copy instruction, set COPYCMD= /Y. For proper usage, refer to the SET command.

Remarks

When no filename is specified for the target, the new copy is given the same name as the source filename.

When no *drive* or *path* is specified for the source, the current drive and directory are assumed. When no *drive* or *path* is specified for the target, the current drive and directory are assumed.

If a drive name only is specified without a *path*, the current directory for that drive is assumed.

Both source and target *filenames* may include wildcard characters (*) and (?) to specify a set of several files.

Examples

```
COPY LETTER.TXT A:
```

Copies the file LETTER.TXT (in your current drive and path) to the current directory on the disk in drive A:.

```
COPY *.DOC A:
```

Copies all files in the current directory with an extension of .DOC to the default directory of drive A:.

```
COPY DATAORIG.DOC DATABACK.DOC
```

Creates a backup copy, DATABACK.DOC, from the file DATAORIG.DOC. The new file is located in the current directory.

```
COPY JAN.DAT + FEB.DAT + MAR.DAT QTR1.DAT
```

Copies the files JAN.DAT, FEB.DAT, and MAR.DAT in sequence into the single file, QTR1.DAT.

```
COPY CON NEWFILE.TXT
```

Sets up your console (keyboard) to input directly to NEWFILE.TXT. Ctrl+Z followed by Enter closes the file and returns to normal command line operation.

COUNTRY

CONFIG.SYS Command

ROM-DOS supports multiple country formats for time, date, and currency, and other basic country-specific information. A country is identified by a three-digit, international telephone country code.

Syntax

COUNTRY = *countrynumber* [*codepage*]

Remarks

The file COUNTRY.SYS must be present in the same directory as your CONFIG.SYS file.

If you do not specify a code page, ROM-DOS uses the default code page for the chosen country. If a code page is specified, it must be either the default or alternate code page for the chosen country.

This command affects the ROM-DOS DATE and TIME commands. Applications that use DOS functions to determine the date, time or currency format, or request that DOS provide character sort order or uppercase information, are affected as well.

Refer to the table provided on page 31 for a list of the currently supported countries.

Examples

```
COUNTRY= 049
COUNTRY = 049, 437
```

The next time you start ROM-DOS with either of these COUNTRY commands, the DATE and TIME will be displayed as follows:

```
DATE
   Current date is Wed 20.06.1998
   Enter new date (dd.mm.yyyy):
TIME
   Current time is 16:39:54,45
   Enter new time:
```

The first COUNTRY command above uses codes page 850, by default, for sorting and case conversion. The second COUNTRY command example uses the specified code page 437 instead.

CTTY (Change TeleTYpe)

Internal Command

The CTTY command directs input and output to a different device other than your computer's standard keyboard and monitor.

Syntax

CTTY *device*

Remarks

Use CTTY for any situation requiring interaction with an alternate console.

The CTTY command only affects communication with ROM-DOS and with programs that work through ROM-DOS for input and output. For example, BASIC uses standard keyboard input regardless of previous CTTY command usage.

Examples

```
CTTY COM2
```

Sets the device on COM2 as the input/output device.

```
CTTY CON
```

Returns control to the standard keyboard.

DATE

Internal Command

The DATE command displays the current date (month, day, year) as known to ROM-DOS and also allows you to change it.

Syntax

DATE [*mm-dd-yy*]

DATE [*mm-dd-yyyy*]

Remarks

The date set by this command is used, among other things, for date stamping your file revision dates. This information is displayed when you execute a directory listing of your files.

You may want to include the DATE command in your AUTOEXEC.BAT file, so you can set the date during boot. If your computer has an internal, battery-operated clock, you won't need to do so.

The format of the date command is also dependent on the country specified in CONFIG.SYS. The date is displayed according to local standards for the specified country.

Refer also to the TIME command.

Examples

When entering this command without specifying *mm-dd-yyyy*, the current date as known to ROM-DOS is displayed, and you are prompted to enter a new date.

```
Current date is Sat 6-10-1989
Enter new date (mm-dd-yyyy):
```

If you do not want to change the date, press Enter. Otherwise, key in the current date and press Enter.

Alternatively, you may skip the display and prompting by entering the current date on the command line. To enter June 10, 1999 (assuming US country support), enter the DATE command as follows:

```
DATE 6-10-1999
```

Valid entries for months, days, and years are

mm = 1-12 *dd* = 1-31 yy*yy* = 1980-2099

ROM-DOS calculates the day of the week; do not include it in your entry.

DEL (DELete)

Internal Command

The DEL command deletes a specified file or set of files.

Syntax

DEL [*drive:*][*path*]*filename* [/P]

Remarks

The DEL command and the ERASE command are functionally identical.

When no drive is specified, the default is assumed. When no path is specified, the default path is assumed.

Global filename characters ? and * (wildcards) can be used in the *filename*. This should be done with caution as it is possible to delete multiple files unintentionally.

When the *filename* *.* is used to delete all files in the specified subdirectory, a verification message is displayed:

```
Are you sure (Y/N) ?
```

Enter Y to delete all files in the specified subdirectory.

DEL deletes files within a subdirectory, not the subdirectory itself. For subdirectory removal, refer to the RMDIR command.

Caution: No ROM-DOS command can undelete a file. Although utilities exist that can attempt an undelete, certain factors can cause the deleted file to be partially or totally lost. The DEL command should be treated as a permanent deletion.

Options

The /P option causes DEL to pause and prompt you before each file is deleted. This option is most useful when deleting files with wildcards.

Examples

```
DEL A:*.DOC /P
```

Deletes all files on the A: drive with a .DOC extension. Before each file is deleted, you are prompted to determine if that file should be deleted. A sample prompt is shown below:

```
C:\> DEL MYLETTER.DOC
MYLETTER.DOC,   Delete (Y/N) ?
```

Deletes the file MYLETTER.DOC from the current default subdirectory.

```
DEL *.DOC
```

Deletes all files in the current subdirectory with a .DOC file extension.

DEVICE

CONFIG.SYS Command

The DEVICE command installs a device driver.

Syntax

DEVICE = [*drive*] [*path*] *driver name* [*arguments*]

Remarks

A device driver allows ROM-DOS to access hardware that is not common in all PCs.

The full drive path and filename of the device must be specified. The arguments are different depending on the device driver.

Example

```
DEVICE=C:\BIN\VDISK.SYS 120 /e
```

Installs the ROM-DOS RAM disk driver, VDISK.SYS, via the DEVICE command and dedicates 120KB of extended memory to the RAM disk.

DEVICEHIGH

CONFIG.SYS Command

The DEVICEHIGH command loads an installable device driver into the upper memory area, if available.

Syntax

DEVICEHIGH **=** [*drive*] [*path*] *driver name* [*arguments*]

Remarks

A device driver allows ROM-DOS to access hardware that is not common in all PCs. A device can be loaded into the upper memory areas if they are available and there is enough free upper memory to accommodate the driver's needs. To make high memory available, the EMM386.EXE and HIMEM.SYS utilities must be loaded. If these utilities are not loaded or there is not enough upper memory available, the device is loaded into conventional memory.

The full drive path and filename of the device must be specified. The arguments differ depending on the device driver.

Example

```
DEVICEHIGH=C:\BIN\MYDEVICE.SYS /20 /M
```

Installs a driver MYDEVICE with its command line arguments as specified. The device is loaded into upper memory, if available.

DIR (DIRectory)

Internal Command

The DIR command displays a list of the files that are in a specific directory.

Syntax

DIR [*drive:*] [*path*] [*filename*] [/*option*]

Remarks

Use the DIR command to list all the files in a directory or to show the directory entries of specific files. The standard directory display format includes columns for filenames, filename extensions, file sizes, and the dates and times the files were created.

Options

The /A option causes the DIR command to display only the files that match the specified *filename* and have the given attribute. The following list shows the legal attribute descriptions.

Attribute	Description
A	Archive-ready for archiving
D	Directories
H	Hidden files
R	Read only files
S	System files
X	Show attributes
-	The minus sign can be used to negate listed attributes. For example, to select all files that do not have the archive bit set, use /A-A option.

The /B or bare option causes the filenames to be displayed without volume label, date, time, or size information.

The /L option causes the filenames to be displayed in lowercase.

The /P option selects page mode, which makes ROM-DOS pause the display each time the screen is full. Press any key to go onto the next page of entries.

The /O option causes the filenames to be displayed in sorted order. The sort order can contain one or more of the following attributes.

Attribute	Description
D	By date and time, newest first
E	Alphabetic order by extension
G	Directories grouped before files
N	Alphabetic order by name
S	By size, smallest first
-	The minus sign can precede the sort option to reverse the sort order. For example, to sort all files in the directory in reverse alphabetic order, use /O-N option.

The /S option causes the display to include files in subdirectories also.

The /V option enables verbose mode.

The /W option displays the list in a wide format without date, time, or size.

The /4 option displays the date with a 4 digit year. The default behavior is to display the last 2 digits of the year..

The DIRCMD environment variable can be used to set the default preferences for the DIR command. The SET command assigns the values to an environment variable. Refer to the SET command for proper usage. For example, to always have the /P option set for

DIR, use the statement SET DIRCMD=/P. You can override the default settings in DIRCMD by using the minus sign (-) preceding the option. To cancel the paging for a single use of the DIR command, enter DIR /-P.

The DIRSIZE environment variable is useful for nonstandard screen sizes. As with the DIRCMD variable, the SET command assigns the values. The syntax is

SET DIRSIZE *rows*[,*columns*]

The values for *rows* and *columns* only have an affect when you use the /P or /W options with the DIR command. The /P (paging) option uses *rows* to display the correct number of lines before pausing. The /W (wide display) uses the *columns* argument to display the correct number of columns across the width of the screen.

Examples

```
DIR
```

Lists the directory entries of all files in the current drive and directory.

```
DIR B:\MEMOS
```

Lists all files in the subdirectory MEMOS on drive B:.

```
DIR A:*.RPT/P
```

Lists the directory entries for all files in drive A: with the extension RPT, displayed one screen at a time.

```
DIR /ON
```

Lists all files in the current directory, sorted by filename order.

```
DIR /AH
```

Lists all hidden files in the current directory.

```
DIR *.DOC /B
```

Lists all files in the current directory with a .DOC extension without file sizes or volume labels.

DOS

CONFIG.SYS Command

ROM-DOS can be loaded into an upper portion of memory referred to as the High Memory Area (HMA), freeing more of conventional (lower 640KB) DOS memory for use by applications.

Syntax

DOS=[HIGH | LOW]

Remarks

The DOS=HIGH command frees up more of the standard DOS memory for use by applications.

This command only works on 286 and higher CPUs with extended memory and Datalight's HIMEM.SYS High Memory Manager, or equivalent, installed. It will not work on standard XT class PCs. Setting DOS=HIGH is ignored when ROM-DOS is in ROM.

Refer also to the **HIMEM** device driver description on page 102.

Example

```
DEVICE=HIMEM.SYS
```

```
DOS=HIGH
```

Loads the high memory area device driver and then loads ROM-DOS into the HMA for increased conventional memory. The high-memory-area device driver must be loaded first, before DOS=HIGH.

ECHO

Batch File, Internal Command

The ECHO command controls whether ROM-DOS commands and other messages are displayed during batch file execution. ECHO also allows you to create your own messages for display.

Syntax

ECHO [ON|OFF]

ECHO *message*

ECHO

Remarks

The ON option is the default ECHO setting. It causes commands in a batch file to be displayed as ROM-DOS executes them. Typing ECHO OFF turns off such display, after which the ON option switches it back on again.

The ECHO command alone, entered without the ON or OFF option, displays the current ECHO setting.

The *message* option is a string of characters, such as a warning or a reminder, that you want ROM-DOS to display. Although your message displays whether ECHO is on or off, the message display is useful only when ECHO is off.

To create a message, enter ECHO followed by your message. If your message is more than one line long, the ECHO command must begin each line of the message.

The @ symbol can be used to suppress the echoing of a single command when ECHO is on. Place the @ symbol first on the command line. Refer also to the description of the @ command for additional information.

Examples

```
ECHO This batch file moves files
ECHO to another directory.
```

A batch file message with more than one line.

```
ECHO OFF
```

Sets the ECHO to off.

ERASE

Internal Command

The ERASE command deletes a specified file or set of files.

Syntax

ERASE [*drive:*] [*path*]*filename* [/P]

Remarks

The DEL command and the ERASE command are functionally identical.

When no drive is specified, the default drive is assumed. When no path is specified, the default path is assumed.

Global filename characters ? and * can be used in the *filename*. This should be done with caution as it is possible to delete multiple files unintentionally.

When the *filename* *.* is used to delete all files in the specified subdirectory, a verification message is displayed.

```
Are you sure (Y/N) ?
```

Enter Y to erase (delete) all the files in the specified subdirectory.

Caution: ROM-DOS has no command to unerase a file. Although utilities exist that can attempt an unerase, certain factors can cause the erased file to be partially or totally lost. The ERASE command should be treated as a permanent erase.

ERASE deletes files within a subdirectory, not the subdirectory itself. For subdirectory removal, refer to the RMDIR command.

Options

The /P option causes ERASE to pause and prompt before each file is deleted. This option is most useful when deleting files with wildcards.

Examples

```
ERASE MYLETTER.DOC
MYLETTER.DOC,   Delete (Y/N)?
```

Erases the file MYLETTER.DOC from the current default subdirectory.

```
ERASE *.DOC
```

Erases all files in the current subdirectory with a .DOC file extension.

```
ERASE A:*.DOC /P
```

Erases all files on the A: drive with a .DOC extension. Before each file is erased, you are prompted to determine whether that file should be erased.

EXIT

Internal Command

The EXIT command exits a secondary nested ROM-DOS operation and returns control of the system to the primary program.

Syntax

```
EXIT
```

Remarks

The EXIT command has no affect if a secondary COMMAND.COM command processor has not been loaded since the primary COMMAND.COM is always loaded in a

permanent mode. A secondary COMMAND.COM is affected if it is loaded without the /P permanent option.

FCBS

CONFIG.SYS Command

The FCBS command allows you to specify the number of File Control Blocks (FCBs) open at one time.

Syntax

FCBS = *number* [,*minimum number*]

Remarks

Number specifies the maximum number of FCBs open at any given time. The default for this value is 4. The value for *number* must be in the range from 1 to 255. The *minimum number* specifies the minimum number of FCBs to be open at all times. The *minimum number* argument has the same default and range value as the *number* argument.

Example

```
FCBS = 8, 4
```

Sets the maximum number of FCBs to 8 and leaves at least 4 open at all times.

FILES

CONFIG.SYS Command

The FILES command specifies the maximum number of files that may be open at one time.

Syntax

FILES = *number*

Remarks

The number of files includes the standard files, *stdin*, *stdout*, *stderr*, *stdprn*, and *stdaux*. The minimum value is 8, and the maximum is 255. All other values are ignored.

Example

```
FILES = 10
```

Specifies the maximum number of open files to ten.

FOR

Batch File Command

The FOR command allows repeated execution of a ROM-DOS command applied to a set of files.

Syntax

FOR `%%`*variable* `IN (`*set*`) DO` *command* `%%`*variable*

Remarks

During execution, this command attaches the *variable* as an identifier to each file in the *set* of files described; it then applies the *command* to each of these identified files. The *set* may be an exact list of complete filenames or a global file specification using wildcard characters.

The FOR subcommand can be used directly on the command line and within a batch file. To use on the command line, substitute a single percent (%) symbol for the double percent signs (%%).

Examples

```
FOR %%N IN (Q1.TXT Q2.TXT) DO PRINT %%N
```

Prints only the files Q1.TXT and Q2.TXT.

```
FOR %%N IN (*.TXT) DO PRINT %%N
```

Prints all files in the current default directory with a .TXT extension.

GOTO

Batch File, Internal Command

The GOTO subcommand transfers control to another line of the batch file.

Syntax

GOTO *label*

Remarks

The *label* is another line in the batch file consisting of a string up to eight characters long. The label may be an environment variable.

If the specified *label* is not found, then the batch file terminates with the error message

```
Label not found.
```

Example

```
GOTO MESSAGE
```

This command moves the control of execution within the batch file to a line that says

```
:MESSAGE
```

Note: A batch file label must be preceded by a colon (:).

HELP

Internal Command

The HELP command provides on-line help of each ROM-DOS command.

Syntax

HELP *command*

Remarks

The *command* argument refers to any ROM-DOS internal command or external utility.

The COMMAND.HLP file must be available (i.e., in the path) to use this command. If it is not available, an error message occurs, indicating that COMMAND.HLP cannot be found.

HELP serves as a memory aid. For complete information about ROM-DOS commands, always consult this manual.

HELP for each *command* can also be displayed by entering a /? following the command name.

All available batch file commands are also listed by HELP.

Examples

```
HELP DIR
DIR /?
```

Both commands list the help of the DIR command.

IF

Batch File Command

The IF subcommand allows conditional execution of commands.

Syntax

IF [NOT] *condition command*

Remarks

The *condition* may be any one of the following:

`ERRORLEVEL` *number*

string1 == string2

`EXIST [`*drive:*`][`*path*`]`*filename*

If the *condition* is true, then the *command* is executed. Otherwise the *command* is bypassed, and the next command in the batch file is executed. The [NOT] option tests the opposite of any condition.

The ERRORLEVEL *number* is true if the last program to execute had an exit code equal or greater than *number*. Using the [NOT] option with this condition tests if the exit code is less than the *number* argument.

The condition *string1* == *string2* is only true when *string1* and *string2* are identical. The strings must match exactly; uppercase/lowercase mismatches are not allowed. Applying the [NOT] option creates a condition that is true only when the strings are not identical.

The EXIST *filename* is true if the specified *filename* is found. Wildcard characters are allowed in the *filename*. The [NOT] EXIST condition is true when the *filename* cannot be found.

Examples

```
IF ERRORLEVEL 15 GOTO EXIT
```

Will GOTO the :EXIT label if the ERRORLEVEL was equal to or greater than 15.

```
IF %1 == CONFIG.SYS PRINT %1
```

Prints the file stored as the %1 parameter only if its exact name is CONFIG.SYS.

```
IF NOT EXIST OLD COPY CONFIG.SYS OLD
```

Copies CONFIG.SYS to OLD if a file named OLD does not exist.

INCLUDE

CONFIG.SYS Command

The INCLUDE command includes the contents of one configuration block into another. The instructions from the originating instruction block, as well as the included block, are carried out. This command can only be used within a CONFIG.SYS configuration block.

Syntax

INCLUDE = *blockname*

Remarks

This command is useful for sets of instructions common to several system configurations. The commands are defined once in a single configuration block and then inserted into other configuration blocks via the INSERT command. For additional details, refer to '**Using Multiple-User Configurations**' on page 24.

Example

```
:
:
[MISC]
device=mouse.sys
device=c:\network\loadnet.sys

[WORDPROC]
files=20
buffers=10
set path=c:\bin;c:\wp;c:\dict
INCLUDE=MISC
.
.
.
```

When you choose WORDPROC from a CONFIG.SYS menu, the instructions in the configuration block labeled [WORDPROC] are carried out. The instructions in the INCLUDED block labeled [MISC] are also implemented as part of the [WORDPROC] block of instructions.

INSTALL

CONFIG.SYS Command

The INSTALL command loads Terminate and Stay Resident (TSR) programs during CONFIG.SYS processing.

Syntax

INSTALL = [*drive:*][*path*] *TSR_Program TSR_Arguments*

Remarks

The TSR program is loaded the same as if loaded from AUTOEXEC.BAT, except that an environment is not created. The lack of an environment may cause some programs to execute incorrectly. These programs must be loaded from the AUTOEXEC.BAT file.

Example

```
INSTALL = C:\BIN\MOUSE.COM
```

Loads a mouse driver from CONFIG.SYS using INSTALL. Command line arguments can be included.

LASTDRIVE

CONFIG.SYS Command

The LASTDRIVE command sets the maximum number of drives.

Syntax

LASTDRIVE = *letter*

Remarks

letter may be any character between A and Z and is the last drive letter that ROM-DOS can access. The default value for *letter* is E.

The minimum number for LASTDRIVE is the number of drives in your computer. If *letter* is less than number of drives in your computer, then the LASTDRIVE command is ignored.

LASTDRIVE is often used to cause ROM-DOS to make more space for nonstandard drives that are not in your system. These drives may be CD-ROM drives, flash disk drives, or network drives.

Example

```
LASTDRIVE = H
```

Causes ROM-DOS to allocate space for eight drives. If the computer has five drives installed, there is room for three additional nonstandard drives.

LFNFOR

Batch File Command

The LFNFOR command enables/disables long file names when processing FOR commands.

Syntax

LFNFOR [ON | OFF]

LOADHIGH

CONFIG.SYS, Internal Command

The LOADHIGH command loads an executable or TSR program into the upper memory area, if available. LOADHIGH can be run as a batch file command or from the DOS command line.

Syntax

LOADHIGH = *[drive:][path]executable [arguments]*

-or-

LH = *[drive:][path]executable* [*arguments*]

Remarks

An executable or TSR program can be loaded into the upper memory areas when they are available and have enough free upper memory to accommodate the program's needs. To make high memory available, the EMM386.EXE and HIMEM.SYS utilities must be loaded. If these utilities are not loaded or there is not enough upper memory available, the program loads into conventional memory.

The full drive path and filename of the device must be specified. The arguments are different depending on the device driver.

Example

```
LOADHIGH=C:\apps\checkit.exe /p
```

Installs an executable named CHECKIT with its command line arguments as specified. The program loads into upper memory, if available.

MENUCOLOR

CONFIG.SYS Command

The MENUCOLOR command allows you to set the text and background colors for the startup menu. This command can only be used in a menu block within your CONFIG.SYS file.

Syntax

MENUCOLOR = *text_color* [,*background_color*]

Remarks

The *text_color* argument selects the display color for the screen text. The color numbers 0 to 15 can be selected from the list below for the text color.

The *background_color* argument is optional. If a value is not entered, the default color 0 (Black) is used. Be sure to specify different colors for background and text, and separate the numbers with a comma. For best results, choose contrasting colors. Only the color numbers 0 to 7 can be used as the background color designation.

For systems whose BIOS does not directly support a video display, such as Datalight's miniBIOS, the standard CONFIG.SYS menu commands, which rely on BIOS screen support, are unusable. To use these commands, the color number sequence of 0 for *text_color* and the default background color (black), or 0,0 for text and background colors can be selected. These numbers represent a color choice of black text with a black background, which is an unusable choice for screen viewing. Using the black/black combination in the MENUCOLOR command line signifies to ROM-DOS to display the startup menu in TTY mode without using BIOS screen/cursor positioning or color changing commands.

Color Values:

0 – Black	1 – Blue	2 – Green
3 – Cyan	4 – Red	5 – Magenta
6 – Brown	7 – White	8 – Gray
9 – Bright Blue	10 – Bright Green	11– Bright Cyan
12 – Bright Red	13 – Bright Magenta	14 – Bright Yellow
15 – Bright White		

Examples

```
MENUCOLOR=14,1
```

Displays the menu text in bright yellow on a blue background.

```
MENUCOLOR=5
```

Displays the menu text in magenta with a default background of black.

MENUDEFAULT

CONFIG.SYS Command

The MENUDEFAULT command allows you to set the default menu-item choice and a time-out value for making a menu selection. This command can only be used within a menu configuration block in the CONFIG.SYS file. Refer also to '**Using Multiple-User Configurations**' on page 24.

Syntax

MENUDEFAULT = *blockname*[,*timeout*]

Remarks

The *blockname* argument specifies the default menu item. The value for *blockname* must match a configuration block name defined elsewhere in your CONFIG.SYS file.

The optional time-out argument represents the number of seconds ROM-DOS waits for a user input selection before initializing your system with the default configuration. The time-out period can be set to a value between 0 and 90. If you select 0, the default menu item is automatically implemented without a wait. If you do not enter a time-out value, ROM-DOS will not continue until the Enter key is pressed.

If your system BIOS does not support a video display directly, such as Datalight's miniBIOS, please refer to the MENUCOLOR command for special instructions.

Example

```
[MENU]
menuitem=Word_Proc, Word Processing
menuitem=Network, Network
menuitem=Research, Research and Development
menucolor=15,1
menudefault=Word_Proc,20
```

Makes the Word_Proc configuration block the default menu item. If you fail to make a selection within 20 seconds, the Word_Proc block is processed.

MENUITEM

CONFIG.SYS Command

The MENUITEM command allows you to specify an item on the startup menu. This command can only be used within a menu configuration block in the CONFIG.SYS file. Refer also to '**Using Multiple-User Configurations**' on page 24.

Syntax

`MENUITEM =` *blockname* [,*menu_text*]

Remarks

The *blockname* argument is a user-defined label given to a configuration block defined elsewhere in the CONFIG.SYS file. If a user selects the menu item, all commands in the selected configuration block are processed, along with the instructions that are common to all menu choices (denoted by block header [COMMON]). The *blockname* can be up to 70 characters long and may contain most printable characters, including spaces, backslashes (\), forward slashes (/), commas, semicolons (;), equal signs (=). Square brackets ([]) cannot be used in block names.

The *menu_text* option is a descriptive statement that defines the *blockname*. The *menu_text* is displayed on the screen as a line item in the startup menu. The *menu_text* argument can be up to 70 characters long and can contain any characters. If this argument is left off, the *blockname* is used for the startup menu display.

If your system BIOS does not support a video display directly, such as Datalight's miniBIOS, please refer to the MENUCOLOR command for special instructions.

Examples

```
[MENU]
menuitem=Word_Proc, Word Processing
menuitem=Network, Network
menuitem=Research, Research and Development
menudefault=Word_Proc,20
```

Defines three menu items: Word_Proc, Network, and Research and Development. Each of these has descriptive text and a set of commands defined later in the CONFIG.SYS file. At boot time, these menu items are displayed in the startup menu as follows:

```
ROM-DOS 6.22 STARTUP MENU
1. Word Processing
2. Network
3. Research and Development
Enter a choice: 1
```

MKDIR (MaKe DIRectory)

Internal Command

The MKDIR command creates a new subdirectory.

Syntax

MKDIR [*drive:*][*path*]*subdir*

MD [*drive:*][*path*]*subdir*

where *subdir* is the name of the new subdirectory to be created. Note that MD may be used instead of MKDIR.

Remarks

If no drive or path is specified, the new subdirectory is created within (one level below) the current default directory.

If drive and/or path is specified, everything specified must exist or the command displays an error message.

Examples

```
MKDIR TEMPDIR1
```

Creates a new subdirectory named TEMPDIR1 within the current default directory.

```
MD C:\UTIL\TOOLS
```

Creates a new subdirectory named TOOLS within UTIL, assuming the subdirectory exists.

NEWFILE

CONFIG.SYS Command

The NEWFILE command allows you to continue CONFIG.SYS file processing from a new file. The file can be located in another directory or even on a different drive.

Syntax

NEWFILE=*filename[,device]*

Remarks

The NEWFILE command is especially useful when the CONFIG.SYS file is located on an inaccessible drive or in ROM. Additional device drivers or instructions can be added

easily to the new file and is processed along with the main CONFIG.SYS file upon starting the system.

When the NEWFILE= instruction is processed, control passes from the present file (the one containing the NEWFILE instruction) to the file specified in the command. Any commands placed after the NEWFILE instruction in the original file are not processed.

If the specified filename cannot be located, CONFIG.SYS processing returns to the original CONFIG.SYS file and the next instruction is processed. The next instruction can even be a second NEWFILE= statement, allowing flexibility for systems which may have a variety of drives installed or not installed at boot time. The first successful NEWFILE statement is processed, transferring control to the specified filename. The remaining instructions in the original CONFIG.SYS file, including NEWFILE= statements, are not processed.

NEWFILE commands can be nested. That is, your original CONFIG.SYS can call a second set of instructions via the NEWFILE command. The second file can, in turn, call a third file by using the NEWFILE command, and so on. Be sure that each filename in the successive steps has a unique name, otherwise, you will create an infinite loop as control is passed back to the same file repeatedly.

When NEWFILE is used, it is also created as an environment variable, retaining the value assigned by the NEWFILE= statement. This can be used in an AUTOEXEC.BAT file for further boot-up decision-making.

The presence of *[,device]* on the NEWFILE command line will tell the ROM-DOS kernel to load this device driver before trying to process this NEWFILE statement. The format of this parameter is exactly the same as the parameter for a DEVICE= statement. See page 47 for a description of the DEVICE= statement.

Examples

```
NEWFILE=C:\BIN\NEWCFG.SYS
```

Causes instructions in the file NEWCFG.SYS, located in the C:\BIN directory, to be executed as part of the CONFIG.SYS file.

```
NEWFILE=C:\BIN\NEWCFG.SYS,ROMDRIVE.SYS C000
```

Causes the device driver, ROMDRIVE.SYS, to be executed prior to processing the instructions in the file NEWCFG.SYS as part of the CONFIG.SYS file.

Also, the environment will contain the following entry:

```
NEWFILE=C:\BIN\NEWCFG.SYS
```

Verify this by running the SET command with no parameters.

NUMLOCK

CONFIG.SYS Command

The NUMLOCK command sets the NumLock key on the keyboard to ON or OFF when your computer starts.

Syntax

NUMLOCK=[on|off]

Remarks

Selecting ON designates that the NumLock key is set to on when DOS boots. Selecting OFF designates that the NumLock is off when DOS boots. In either case, you still have the ability to manually turn the NumLock key on and off after booting with the NUMLOCK command.

Example

```
NUMLOCK=on
```

Sets the NumLock key to on when the system boots.

PATH

Internal Command

The PATH command sets the search path for command files that are not in the current directory.

Syntax

PATH [*drive:*][*path*][;[*drive:*][*path*]] ...

Remarks

Without a specified search path, ROM-DOS looks for an external command file (one with a .BAT, .COM, or .EXE extension) only in the current directory. The PATH command tells ROM-DOS which other directories to search after searching the current directory.

To append one or more additional directories to the PATH, use %PATH% for the current path. For example, to add C:\DOS to the current path, enter:

```
PATH %PATH%;C:\DOS
```

at the command prompt.

Enter PATH without parameters to display the current path.

To cancel previously-set command paths, enter:

```
PATH =
```

or

```
PATH =;
```

Example

If your application programs reside on a fixed disk, the PATH command enables you to start any of them from any drive or directory. To access utilities, a word processor, and a spreadsheet in subdirectories C:\UTIL, C:\WP, and C:\123, set the path command as follows:

```
PATH C:\UTIL;C:\WP;C:\123
```

PAUSE

Batch File, Internal Command

The PAUSE command suspends the execution of a batch file and resumes operation when any key is pressed.

Syntax

PAUSE [message]

Remarks

A batch program may require that you perform some action such as changing disks or choosing to continue or terminate the operation. When the command processor encounters PAUSE, it suspends execution and displays the message

```
Strike a key when ready...
```

After you perform the appropriate action, or make a decision, striking any key other than the combinations Ctrl+C or Ctrl+Break resumes the batch job.

If you press Ctrl+C or Ctrl+Break at this point, ROM-DOS displays

```
Terminate batch job (Y/N)?
```

Responding Y ends the batch job. Therefore, strategic placement of the PAUSE command allows you to divide the batch file into sections so you can end it at some intermediate point.

The *message* option allows you to display a reminder on the screen during the pause. Your message precedes the "Strike a key" message. Note, however, that your message appears only if ECHO is on.

Example

```
PAUSE Place blank disk in drive A:
```

Prompts the user to insert a disk and suspends operation until a key has been hit.

PROMPT

Internal Command

The PROMPT command changes the ROM-DOS command prompt.

Syntax

PROMPT [*text*] [$*character*] [$*character...*]

Remarks

The prompt that ROM-DOS normally displays is the letter of the current drive followed by a right angle bracket (>) (the greater-than symbol). By using the PROMPT command, you can change this prompt to include any combination of a message, the current directory, the date, the time, and some other features.

Code	Corresponding Prompt
$T	Current time

Code	Corresponding Prompt
$D	Current date
$P	Current drive and path
$V	ROM-DOS version number
$N	Current drive
$G	The > character
$L	The < character
$B	The | character
$Q	The = sign
$H	A backspace (which erases the previous character)
$E	ASCII code for Escape (X'1B')
$_	Start a new line (carriage return)
$$	The $ character

Examples

To show this prompt

```
Current directory is drive:\path;
Ready for <command>
```

enter

```
PROMPT Current directory is $P;$_Ready for $Lcommand$G
```

To show the date, time, and current directory on separate lines followed by the greater-than character and a space, enter:

```
PROMPT $D$_$T$_$P$G<space>
```

where **<*space*>** refers to pressing the spacebar once. The resulting prompt is

```
Mon 6-26-1989
10:17:45.99
A:\> _
```

REM (REMark)

Batch File, Internal Command

The REM command has two purposes: to allow comments in a batch or CONFIG.SYS file, and to temporarily disable a command without physically deleting the command from the file. See also the (;) command.

Syntax

REM [*message*]

Remarks

The REM command provides information but has no affect on the execution of the batch file.

The comment may consist of any set of characters. You may also create a blank line by omitting the *message* portion of the line.

REM can also be used to temporarily disable a command in a batch file or CONFIG.SYS without having to delete the line from the file.

Examples

```
REM This batch file created by
REM Jane Doe
```

These lines may be added at any point in a batch file as user information only.

```
DEVICE=HIMEM.SYS
DOS=HIGH
REM DEVICE=TESTDEV.SYS /P
```

Temporarily removes the DEVICE=TESTDEV.SYS statement from these CONFIG.SYS instructions. This statement is not processed again until REM is removed.

REN (REName)

Internal Command

The REN command changes the name of a file.

Syntax

REN [*drive:*][*path*]*filename1 filename2*

Remarks

REN renames files within a directory; it does not move a file to a different drive or directory as part of the command.

The wildcard characters * and ? may be used to rename more than one file at a time.

ROM-DOS does not allow you to give a file a name that matches the name of an existing file in the same directory.

Examples

```
REN B:NOTES.DOC REPORT.DOC
```

Renames the file NOTES.DOC in drive B: to REPORT.DOC.

```
REN *.DOC *.TXT
```

Assigns the extension .TXT to all files with the current extension .DOC.

RMDIR (ReMove DIRectory)

Internal Command

The RMDIR command removes (deletes) a specified empty subdirectory.

Syntax

RMDIR [*drive:*][*path*]*subdir*

RD [*drive:*][*path*]*subdir*

subdir is the name of the subdirectory being deleted. Note that RD may also be used.

Remarks

If no drive or path is specified, RMDIR looks for the specified *subdir* within (one level below) the current default directory. If a drive or path is specified, everything specified must exist or ROM-DOS displays an error message.

RMDIR does not remove a subdirectory unless it is empty. An error message is displayed when you attempt to remove a subdirectory that still contains files or other subdirectories.

Example

```
RD TOOLS
```

Removes the TOOLS subdirectory from the current directory, assuming TOOLS is an empty directory.

SET

Internal Command

The SET command sets, displays, or removes environment variables.

Syntax

SET [*variable* = [*string*]]

Remarks

Use the environment variables to control the behavior of programs and batch files and also the behavior of ROM-DOS. Use this command in the AUTOEXEC.BAT and CONFIG.SYS files and on the DOS command line. The environment variables that can be defined with the set command include, but are not limited to, PATH, COMSPEC, PROMPT, and user-defined variables.

Using SET *variable* = with no argument string clears the current environment string for the named variable.

Examples

```
SET PROMPT = $p$g
```

Sets the prompt, although the prompt can also be set with the PROMPT command.

```
SET PROMPT =
```

Clears any previously set prompt settings and returns the prompt to its default state.

SHELL

CONFIG.SYS Command

The SHELL command allows you to specify a command interpreter other than the default COMMAND.COM or to load COMMAND.COM with non-default arguments (parameters). ROM-DOS boots this new program, with arguments, instead of that specified internally.

Syntax

SHELL = *cmd_interpreter arguments*

Remarks

The SHELL command is most often used to start the initial copy of COMMAND with special parameters. One parameter provides a larger environment than the default 128 bytes.

The *cmd_interpreter* can be any executable program. The full path, including drive letter, should be specified if the program is not in the root directory of the default drive.

Arguments are optional and program-specific and vary depending on the *cmd_interpreter* being executed by the SHELL command.

Examples

```
SHELL=C:\COMMAND.COM /E:512 /P
```

Boots the standard Command Processor but sets the environment space to 512 bytes (up from the default 128). The /P parameter tells COMMAND that it is permanent (cannot terminate).

```
SHELL = C:\TEMP\MYPROG.EXE
```

Boots a program named MYPROG.EXE, located in the directory TEMP, instead of the standard Command Processor.

SHIFT

Batch File, Internal Command

The SHIFT command moves each replaceable parameter for a batch file one position to the left. Execution of the SHIFT command allows use of more replaceable parameters in a batch file beyond the standard set of %0 through %9.

Syntax

SHIFT

Remarks

This command moves the string or value stored for each replaceable parameter one position to the left. Upon execution of SHIFT, the %0 argument assumes the value of the %1 argument, the %1 argument then assumes the value of the %2 argument, and so on.

Example

The following batch file reads in a list of files (provided as arguments on the command line) and displays each one to the screen. After displaying each one, the SHIFT command copies the next file in the argument list into the %1 slot, verifying the existence of the file, and continues.

```
Command line argument:
TYPEIT autoexec.bat config.sys net.bat
TYPEIT.BAT batch file:
   :repeat
   if EXIST %1 goto doit
   goto end

   :doit
   type %1
```

```
pause
shift
goto repeat

:end
@echo All Done
```

STACKS

CONFIG.SYS Command

The STACKS command enables the dynamic use of data stacks to handle hardware and software interrupts that use large amounts of stack space. You may use this command only in your CONFIG.SYS file. Use the STACKS command if the system crashes or encounters a stack overflow during the boot or at runtime.

STACKS uses more RAM for the DOS stacks, which you can calculate with the formula (number-of-stack*stack-size). The maximum extra DOS stack size is 32KB (64*512).

Syntax

STACKS = *n*,*s*

Remarks

n specifies the number of stacks. Valid values for n are 0 and integers in the range 8 through 64.

s specifies the size (in bytes) of each stack. Valid values for s are 0 and integers in the range 32 through 512.

SUBMENU

CONFIG.SYS Command

The SUBMENU command defines a menu item that represents a secondary menu when selected. This command may only be used within a menu configuration block in the CONFIG.SYS file.

Syntax

SUBMENU=*blockname* [**,** *menu_text*]

Remarks

The *blockname* argument defines the name of the secondary menu block of commands. The block menu must be defined elsewhere in the CONFIG.SYS file, otherwise, ROM-DOS leaves this item off of the startup menu. The label can be up to 70 characters long and can contain most printable characters, including spaces, backslashes (\), forward slashes (/), commas (,), semicolons (;), and equal signs(=). Square brackets ([]) cannot be used in blocknames.

The optional *menu_text* argument specifies the text that ROM-DOS displays for this menu item on the startup menu. If this argument is left out, ROM-DOS displays the

blockname as the text. The *menu_text* can be up to 70 characters long and may contain any character.

The submenu can be defined with any user-provided descriptive label. It need not have the [MENU] label.

Example

```
[MENU]
menuitem=Word_Proc, Word Processing
menuitem=Network, Network
submenu=Research, Research and Development
menucolor=15,1
menudefault=Word_Proc,20
   [WORD PROC]
   files=10
   buffers=10
   lastdrive=m
   device=c:\network\loadnet.sys
[NETWORK]
include=Word_Proc
numlock=off
   [RESEARCH]
   menuitem=proj1, Project 1
   menuitem=proj2, Project 2
   menudefault=proj1
   [PROJ1]
   files=50
   buffers=25
   numlock=on
   [PROJ2]
   files=10
   buffers=20
   device=vdisk.sys 64 /e
   numlock=off
```

In the preceding example, a submenu is defined as one of the startup menu choices. When you select Research and Development from the first menu, a secondary menu is displayed, offering the choices of Project 1 and Project 2. The actual commands for Project 1 and Project 2 are defined in the configuration blocks labeled PROJ1 and PROJ2.

SWITCHES

CONFIG.SYS Command

The SWITCHES command allows special CONFIG.SYS file options.

Syntax

SWITCHES=[/k][/n][/f]

Remarks

The /k argument makes an enhanced keyboard behave like a conventional keyboard.

The /n argument prevents the use of the F5 and F8 function keys to bypass the startup commands.

The /f argument instructs ROM-DOS to skip the delay after displaying the "Starting ROM-DOS..." message at boot time. The delay allows you time to use the F5 and F8 options to alter the processing of the CONFIG.SYS and AUTOEXEC.BAT files as described in page 26.

Example

```
switches = /n
```

Prevents you from using the F5 and F8 keys at boot time.

TIME

Internal Command

The TIME command displays the current time as shown on the system's internal clock. Allows resetting of the clock.

Syntax

TIME [*hh*:*mm*:*ss*] [pm|am]

Remarks

The time set by this command is used, among other things, for time stamping your file revision dates. This information is displayed when you execute a directory listing of your files.

You may want to include the TIME command in your AUTOEXEC.BAT file to set the date at boot time. If your computer has an internal, battery-operated clock, you won't need to do so.

The format of the time command is also dependent on the country specified in CONFIG.SYS. The time is displayed according to local standards for the specified country. Refer also to the DATE command.

If you just want to check the time maintained by ROM-DOS, enter the TIME command alone. ROM-DOS displays something like this

```
Current time is 3:00:02.48p
Enter new time:_
```

After which you press Enter to return to an empty command line.

When you want to change the time, you can include the desired time on the prompt line after the word TIME. Or you may enter the command with no option (as you do to check the time) and enter the new time before pressing Enter.

ROM-DOS displays the time according to the 24-hour clock with the *a* or *p* indicator to show AM or PM. The AM / PM indicator can be entered as *a* or *p* or as *am* or *pm*. The time may be entered in a 24-hour format or a 12-hour format with the AM or PM designators.

The allowed options for hours and minutes are

hh = 0-24 *mm* = 0-59 *indicator* = a, p, am, or pm

ROM-DOS displays time to hundredths of seconds. When entering time, however, you needn't enter seconds or hundredths; ROM-DOS assumes a value of zero if they are not specified.

You may skip the display and prompting by typing the current time after the word TIME on the command line

```
TIME 23:24
```

ROM-DOS accepts your entry as the current time.

Examples

To set the time to 11:15 p.m., enter

```
TIME 23:15 or TIME 11:15 p
```

To set the time to 9:26 a.m., enter

```
TIME 9:26 or TIME 9:26 am
```

TRUENAME

Internal Command

The TRUENAME command displays the actual path of virtual drives created with SUBST, network drives, normal drives, and the contents of environment variables.

Syntax

TRUENAME [*path* |*% environmentvariable%*]

Remarks

TRUENAME will display the full path to a network drive or a drive created with SUBST.

If TRUENAME is not given a path or environment variable it will display the full path of the current drive up to the current directory.

Long directory or file names will be truncated to 8.3 format.

Network drives will be expanded to show the drive letter in //SERVER/VOLUME: format.

Option

The %environmentvariable% option will cause TRUENAME to display the contents of the envrionment variable passed to truename.

Examples

```
TRUENAME C:
```

Displays the full true path of drive C:.

```
TRUENAME G: (where G: is a drive created with SUBST)
```

Displays the full true path of the actual drive and path that was SUBST'd.

TYPE

Internal Command

The TYPE command displays the contents of a text file on the screen.

Syntax

TYPE [*drive:*][*path*]*filename* [*/P*]

Remarks

The *drive* and/or *path* arguments must refer to a valid drive and directory combination.

The *filename* may not contain any wildcards.

If a file containing formatting codes or other nonalphanumeric characters is displayed with TYPE, unintelligible characters are displayed. This does not harm the system.

The */P* causes a pause after every screen full of text.

Example

```
TYPE A:AUTOEXEC.BAT
```

Displays the AUTOEXEC.BAT file on drive A.

VER

Internal Command

The VER command displays the version number of the ROM-DOS in use and allows revision of this version number.

Syntax

VER [*n.nn*] [/R]

Remarks

If a new version number is specified, two digits after the decimal are required. Note that this command revises only the record of the DOS version number; it does not change the actual operating system loaded in the computer.

The version command shows both the version of the VER command itself and the version of DOS in operation.

Option

The /R option shows the full version and revision number of ROM-DOS.

Example

```
VER 5.0
```

Changes the record of the current DOS version in use to DOS 5.0. Any programs that are executed, following this command, recognize that DOS 5.0 is running.

VERIFY

Internal Command

The VERIFY command displays or modifies the VERIFY state.

Syntax

VERIFY [ON | OFF]

Remarks

The VERIFY command does not perform any data verification (same as the COPY /V option). It is included to provided batch file compatibility.

VOL

Internal Command

The VOL command displays the volume label on a specified disk.

Syntax

VOL [*drive:*]

Remarks

If you do not specify a *drive*, the current drive is assumed. VOL does not allow the setting of volume labels. Refer to the LABEL command on page 105 for instructions on setting the volume labels.

Examples

```
VOL
```

Causes ROM-DOS to display the volume label on the current drive.

```
VOL C:
```

Causes ROM-DOS to display the volume label on the C: drive.

Chapter 6, ROM-DOS Utility Descriptions

ROM-DOS Utilities

Command Descriptions

The following pages provide a complete description of each ROM-DOS external command. Each entry includes a description of the command's purpose, command entry syntax, remarks, and examples as appropriate. *External* commands are stand alone utility programs and device drivers.

For on-line help information and syntax descriptions, use the /? option with any command. For example:

```
XCOPY /?
```

ANSI

ANSI.SYS is a console device driver that allows you to support ANSI codes on the local display.

Syntax

Device=ANSI.SYS [options]

Remarks

ANSI.SYS supports standard ANSI escape sequences.

ANSI.SYS writes directly the screen when using text video mode.

Options

The /K option forces use of the extended keyboard BIOS calls which sense F11 and F12.

The /X option lets you redefine the extended keys independently.

The /S option disables the keyboard redefinition feature.

The /T*nn* option indicates that the video mode *nn* is a text mode. By default, modes 0, 1, 2, 3 and 7 are text modes.

Examples

```
DEVICE=ANSI.SYS
```

This example loads ANSI.SYS with default settings.

```
DEVICE=ANSI.SYS /T54 /S
```

Load ANSI.SYS with mode 54h as a video text mode and disable keyboard redefinition.

ATA

ATA.SYS is a PCMCIA ATA disk device driver.

Syntax

DEVICE = ATA.SYS [/A*xxxx*] [/I*xxxx*]

Remarks

ATA.SYS requires an Intel 82365 or compatible controller. The PCMCIA controller card itself is always mapped to addresses 3E0h and 3E1h. These are fixed addresses and can not be changed. This driver supports only 5-volt ATA cards. Up to two drives can be supported with the driver. Use the Datalight FORMAT command to format an ATA disk, if it is not already formatted.

ATA Cards tested:

Integral 1841PA 17MB ATA card 660KB/s write, 690KB/s read

Toshiba TH6SS160201AA 20MB ATA card 900KB/s write, 1200KB/s read

SanDisk SDCFB 4MB CompactFlash card 300KB/s write, 1000KB/s read

SanDisk SDP3B 2MB ATA card 275KB/s writen 1000KB/s read

Controllers tested:

Vadem VG-465

Intel 82365SL rev A

Options

The /A*xxxx* option sets the memory window that the ATA card gets mapped to for use. This is a 4KB window. The default is C000. Replace *xxxx* with the correct memory segment window for your installation.

The /Ixxxx options sets the I/O address where the ATA card is mapped to by the controller. The default I/O address is 240h. The memory usage for this is 16 bytes starting at the given address.

Examples

```
DEVICE = ATA.SYS
```

Load ATA.SYS with the default memory segment and I/O address settings.

```
DEVICE=ATA.SYS /AD000 /I290
```

Load ATA.SYS using memory segment address D000h and I/O address 290h

ATTRIB

The ATTRIB command either displays or modifies the attributes of a file or directory.

Syntax

ATTRIB [+R | -R] [+A | -A] [+S | -S] [+H | -H] [[drive:][path]filename] [/S] [-C]

Remarks

The file attributes define the characteristics of a file. They determine if a file may be deleted or modified, or if it is archived. Use the ATTRIB command to manage these file attributes.

Wildcard characters may be used in the ATTRIB *filename.*

The ATTRIB command modifies file attributes if modify commands are given to ATTRIB. The modify commands are

Option	Description
+/-	Add(+) or remove(-) attribute inserted before each option.
A	Archive attribute
-C	Clear all attributes
H	Hidden file attribute
R	Read Only attribute
S	System file attribute
/S	Recurse into subdirectories

If ATTRIB finds no modify commands, then it displays the files in the specified directory along with the filenames and their current attributes.

Examples

```
ATTRIB +r myfile.dat
```

Adds the Read Only attribute to the file `myfile.dat`.

```
ATTRIB -a -r *.dat
```

Removes the Read Only attribute and the Archive attribute of all files with the .DAT extension.

```
ATTRIB *.dat
```

Displays the attributes of all files with the .DAT extension.

BACKUP

The BACKUP command backs up a single directory tree to a floppy drive, hard disk, or network drive.

Syntax

BACKUP *srcpath dstdrive* [/A] [/H] [/L[:<*logname*>]] [/M] [/S] [/Y] [/?]

Remarks

The complement program, RESTORE, restores a backup set to hard disk. Backup creates one or more backup volumes in the form of DL970507.001, where the year, month, and day compose the name, and the volume number is the file extension.

The <*srcpath*> (source path) can be any legal DOS path, with an optional file mask, such as D:\SOURCE*.C.

The <*dstdrive*> (destination drive) can be any legal DOS drive.

Note

At the time this manual was updated, this utility did not contain long filename support.

Options

The A option appends the data to an existing backup file.

The /H option backs up hidden files as well as normal files.

The /L option writes a .LOG file in ASCII text form. If no log filename is specified, BACKUP creates a .LOG file in the current directory.

The /M option backs up only files that do **not** have the archive bit set. BACKUP automatically clears the archive bit for each file it backs up. Use Datalight ATTRIB to view/set the archive bit manually.

The /S option backs up the entire tree, not just the one directory.

The /Y option allows BACKUP to operate in batch files with no user input (affirmative is given for all prompts). However, if the backup set requires multiple floppies, BACKUP prompts for all floppies after the first one.

Note: BACKUP operates much faster while using any disk cache program.

Example

The following command backs up all files in the C:\DEV\ROMDOS directory, including subdirectories, to the B: drive.

```
BACKUP C:\DEV\ROMDOS B: /S
```

CHKDSK (CHecK DiSK)

The CHKDSK command checks the disk directories and File Allocation Table (FAT) and displays a disk and memory report.

Syntax

CHKDSK [*drive:*][*path*][*filename*][/C] [/F] [/V] [/[ ]

Remarks

CHKDSK examines a disk and determines whether it has any errors in the File Allocation Table (FAT) and optionally fixes errors.

Options

The /C option allows CHKDSK to correct errors without user confirmation. This option can be used along with the /F option for corrections to be made without user confirmation.

The /F option causes CHKDSK to fix FAT or directory errors on the disk if any are found. If /F is not specified, then CHKDSK acts as if fixing the disk, but no corrections are written to the disk.

If errors are detected, you are prompted with a message similar to the following:

```
15 lost allocation units found in 5 chains.
Convert lost chains to files?
```

If you answer Y for Yes, each lost chain is written to a file in the root directory of the current drive. Each file will have the name FILE*nnnn*.CHK. *nnnn* will be a sequential number. The first chain will be in FILE000.CHK. These files can be verified to see if they contain valuable information, and then deleted if desired. If you answer N for No to the above prompt, CHKDSK still makes the corrections, however, the lost chains are not saved to the disk.

The /V options causes CHKDSK to display each path and file as it is processed.

The /[options causes CHKDSK to hide the program signon message.

If a *filename* is used, then CHKDSK displays all files matching that specification that have noncontiguous data areas on the disk. Files that are stored in noncontiguous areas, especially .EXE files, have slower disk access times. If CHKDSK reports a large number of files with this problem, you should use a utility program that optimizes the files and frees space on your disk.

After checking the disk, CHKDSK displays any error messages followed by a report on the state of the disk that was checked. An example of the report is shown below.

```
Volume ROM-DOS   created 11-09-2001 1:00a
Volume Serial Number is 190E-4AA2
       362496 bytes total disk space
            0 bytes in 1 hidden files
         6144 bytes in 2 user files
       356352 bytes available on disk

       655360 bytes total memory
       595360 bytes free
```

CHKDSK does not wait for a disk to be inserted before the checking is initiated, nor does it repair any errors.

Examples

```
CHKDSK a:
```

Checks the integrity of drive A:. The report is printed to the console.

```
CHKDSK d: >drive_d.rpt
```

Checks the integrity of hard drive disk D. The report is saved in a file named DRIVE_D.RPT.

CHOICE

The CHOICE command allows a user to select between different options during the processing of a batch file.

Syntax

CHOICE [/C[:]*keys*] [/N] [/S] [/T[:]*c,nn*] [*Prompt Text*]

Remarks

/C[:]*keys* specifies the allowed keys for the user prompt. The colon is optional for the command syntax. The default selection for the keys is YN. More than two key choices may be entered.

/N prevents display of the user prompt. The selected keys are still valid, but they are not displayed in the prompt message.

/S selects case-sensitivity regarding the prompt. With the /S switch, you must enter the response in the exact case used with the /C option.

/T[:]*c,nn* sets a time delay. CHOICE pauses for the specified number of seconds waiting for a response. If none is given, the default key choice is used. The argument *c* is the default-key choice character. The *nn* argument specifies the number of seconds to pause. Valid number selections are from 0 to 99. A 0 setting produces no pause.

Prompt Text for the prompt is optional. You can display different output by using the text field, or not, and by using or removing the /N switch along with the text.

Examples

When the following CHOICE command is used

```
CHOICE /c:ync
```

you will see:

```
 [Y,N,C]?
```

If the text argument is added

```
CHOICE /c:ync Please select Yes, No, or Continue
```

the display will be:

```
Please select Yes, No, or Continue [Y,N,C]?
```

If the key choice prompt is left off

```
CHOICE /n Continue reading file
```

only the following appears (note key choice of YN is default)

```
Continue reading file?
```

A complete batch file example follows. Each prompt selection returns an errorlevel that can be trapped. The errorlevel corresponds to the order of the key choice. For example, with /c:teo, t returns 1, e returns 2, and o returns 3.

```
@echo off
cls
echo.
echo T Run TIME-IN Program
echo E Run Employee Update
echo O Run TIME-OUT Program
echo.
c:\dos\choice /teo /t:t,5 Please select option
if errorlevel 3 goto timeout
if errorlevel 2 goto update
if errorlevel 1 goto timein
:timeout
tmout.exe
goto end
:update
updat.exe
goto end
:timein
tmin.exe
goto end
:end
```

COMM

The COMM communications program provides the ability to communicate with a remote ROM-DOS system. COMM supports Xmodem file transfer, autodialing, Zmodem, and terminal emulation and time zones.

Command Line Options

All command line options must be separated by a space.

Option	Description
/B#	Sets the baud rate to # on startup. The available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.
/COM#	Sets the communications port to COM1 or COM2; both are supported.
/8N1	Sets the serial port to 8 data bits, no parity, one stop bit.
/7E1	Sets the serial port to 7 data bits, even parity, one stop bit.
/8N2	Sets the serial port to 8 data bits, no parity, two stop bits.
/8O1	Sets the serial port to 8 data bits, odd parity, one stop bit.
/8E1	Sets the serial port to 8 data bits, even parity, one stop bit.

You can reverse the placement of the parity and data bits on the command line. For example, /8N1 is equivalent to /N81.

Environment Variables

The environment variable COMM is supported, which may set certain communications parameters. The switches are identical to the command line options, for example:

```
SET COMM= /COM2 /B2400 /7E1
```

Causes COMM to start using COM2, at 2400 baud, with 7 data bits, even parity, and 1 stop bit. If new options are specified on the command line, they override the environment variable settings. Invalid options are ignored.

An additional environment variable for time zones is also supported. The TZ variable allows you compensate for time zone differences when sending and receiving files and when the time stamp on a received file is critical. This variable only affects transfers done with the Z-modem protocol. X-modem transfers are not affected. By default, if no time zone is set, the Datalight utilities COMM and RSZ assume Greenwich Mean Time (GMT).

Setting the TZ variable is not necessary when using all programs. If you are transferring files between two Datalight utilities, the file time stamp is not affected. Some utilities, such as Windows Hyper-terminal, automatically convert the time stamp on the file to GMT and assumes that the receiving program will adjust the time to the correct local time upon receipt.

The syntax for the TZ environment variable is:

SET TZ= <*abbreviation*> +|- *value*

Abbreviation represents any three-letter abbreviation for the chosen time zone. The variable serves as a reminder to the user. For example, if setting the time zone for Pacific Standard Time, the variable could be set as PST; and for Eastern Standard Time as EST. The abbreviation is only a placeholder in the syntax for the TZ variable. There are no incorrect abbreviation choices as long as only three letters are used.

Value represents the number of hours this time zone varies from GMT. For example, the west Coast of the United States is –8 hours relative to GMT. This value may have to be adjusted to compensate for daylight savings time. There should be no spaces between the abbreviation, plus or minus sign, and the value. Some examples are:

```
SET TZ=PST-8
SET TZ=CMT-3
SET TZ=GMT+2
```

If an incorrect format for the time zone is entered, the default of GMT is used.

On a desktop PC running Windows programs, such as Hyper Terminal, determining the time zone is part of the setup of the operating system. However, if COMM is run from a DOS box, the TZ variable still will need to be set on the target machine.

COMM Commands

Enter most commands by pressing an Alt+key combination. Some commands take effect immediately (such as changing the baud rate), while others require further information (such as a filename) before continuing.

If you do not want to execute a command, or want to stop a command while it is running (such as a file transfer), press the Esc key to return to terminal mode.

Command	Description
Alt+B	Sets the baud rate. This command toggles between all the available baud rates. Continue to press Alt+B until the desired baud rate appears on the status line at the bottom of the display.
Alt+C	Clears the display.
Alt+D	Autodial allows entry of number to be dialed. Press Enter to redial the previous number.
Alt+E	Toggle echo (duplex). Press Alt+E to toggle the duplex between full (echo off) and half (echo on).
Alt+H	Hangs up if the modem is capable of hanging up with an ATH0 command.
Alt+P	Toggles through the available parameters allowing settings to be made. Esc cancels the command.
Alt+T	When enabled, pressing the Enter key generates a CR/LF instead of just a CR.
Alt+X	Exits the program. This command does not drop the carrier, so use this command if you need to do MS-DOS operations while online. You can run COMM again without losing the carrier and continue with telecommunications.
PgUp	Sends a file to a remote computer, giving you the option of either Xmodem or ASCII file transfer protocols. Esc cancels at any time during the transfer.

Command	Description
PgDn	Receives a file using the Xmodem or ASCII file transfer protocol. Press Esc to cancel at any time during the transfer.

Terminal Emulation

Currently, COMM supports a subset of the ANSI escape codes that compose the only terminal emulation available. These escape codes, A, B, C, D, H, J, and K, should meet most needs since the emulation includes such features as cursor positioning and erase to the end of the line and/or page.

File Transfer Recovery with Zmodem Protocol

The Zmodem file transfer protocol has the ability to resume a set of file transfers at the point of interruption, such as in the case of a call hang-up or disconnected cable. In the event of a failed Zmodem upload or download, run COMM as follows to resume the file transfer:

1. Press the PgDn key to initiate a receive-file operation
2. Select Zmodem in the file transfer option list.
3. Select Y to enable the ZMODEM crash recovery option.

Auto downloads do not use crash recovery.

COMMAND

The COMMAND command starts a new command processor.

Syntax

COMMAND[/e:*number*][/k *filename*][/p] [/c *string*][/msg]

Remarks

Use this command to start a new instance of the ROM-DOS command processor, the program that contains the internal ROM-DOS commands.

Starting a new instance of the command processor also produces a new environment. The size of the environment is 256 bytes by default but can be changed using the /e switch. The environment size may be larger than the first copy if this is a secondary copy of COMMAND.

Command and its arguments can also be used in a SHELL= statement in your CONFIG.SYS file. Refer to the description of SHELL for more details.

Options

The /e:number switch sets the environment size. *Number* represents the size of the environment in bytes. *Number* must be in the range from 160 to 32,768. All other values are ignored and replaced with the default value of 256. ROM-DOS rounds up the value entered to the nearest multiple of 16.

The /k filename option tells the command processor to run the specified filename and then display the ROM-DOS command prompt. It is not recommended that this option be used in a CONFIG.SYS SHELL= statement.

The /p switch causes COMMAND not to exit but to remain permanent. Use the /p switch only when COMMAND is used in a CONFIG.SYS SHELL statement.

The /c string switch causes COMMAND to execute the command in string and then terminate. The string command can be any internal or external command.

The /msg option causes all error messages to be stored in memory. This option is recommended only for floppy disk-based systems. ROM-DOS keeps many of its error messages in the nonresident portion of COMMAND.COM rather than using valuable memory to store them. If an error message is needed, and you have loaded ROM-DOS from a floppy disk, the message will only be available if the boot disk is still in the drive. By using the /msg option, the message is available in memory at all times. The /p option must be used along with the /msg option.

Examples

```
COMMAND /C DIR C:
```

Causes a new copy of COMMAND to be executed. It performs a DIR command on the C: drive and then exits back to the previous Command Processor.

```
SHELL=C:\COMMAND.COM /P /E:256
```

Loads a permanent copy of COMMAND with an environment size of 256 bytes.

DELTREE

The DELTREE command deletes one or more directory trees or individual files.

Syntax

DELTREE [/Y] [/[ ] [*drive*:]*path* [[*drive*:]*path*[...]]

Remarks

/Y prevents DELTREE from prompting before deleting.

/[hides the program signon message.

[drive:]path indicates the name(s) of the file(s) or directory tree(s) to delete. Wildcards are allowed.

Examples

Datalight DELTREE deletes one or more directory trees. For example, to delete all files and directories in the tree C:\TEMP, enter

```
DELTREE C:\TEMP.
```

You can also use DELTREE to delete individual files, one at a time, using wildcards. For example, to delete selected files in the current directory, enter

```
DELTREE *.*
```

DELTREE then prompts you for each file it finds, allowing you to choose whether to delete them.

Caution: Be careful when using wildcards with DELTREE. DELTREE deletes all specified files and subdirectories regardless of their attributes. Multiple files and/or subdirectories may be specified.

DISK2IMG

The DISK2IMG command creates a binary image of a drive or disk.

Syntax

DISK2IMG *Drive: DestinationPath*

Remarks

The drive specifies the source disk.

The DestinationPath is the name and path for the binary image output.

Options

None

Examples

```
DISK2IMG A: C:\FLOPPY.IMG
```

This command creates a file FLOPPY.IMG containing a binary image of the A: drive.

DISKCOMP

The DISKCOMP command compares contents of two floppy diskettes.

Syntax

DISKCOMP *drive1: drive2:* [*/option*]

Remarks

The drive parameters specify the diskettes to compare.

No matter which drive letters are used, the user will be prompted to insert the diskettes.

The disks that may be compared are 720KB, 1.2MB, and 1.44MB disks. Both the source disk and the target disk must be of the same type

If any problem occurs during the compare process, DISKCOMP indicates the side, track, and sector where the problem occurred.

The source or the target disk may not be a RAM or virtual disk.

DISKCOMP compares only floppy disks, not hard disks.

Options

The /1 option compares only the first side of the diskettes.

The /8 option compares only the first eight sectors of each track.

Examples

```
DISKCOMP A: B:
```

Compares the contents of the diskettes in drive A: onto drive B:.

```
DISKCOMP A: A:
```

Reads the contents of the diskette in drive A:, then prompts for the user to swap diskettes and compares those contents with the new target diskette.

DISKCOPY

The DISKCOPY command copies the entire contents of one floppy disk to another.

Syntax

DISKCOPY *drive1: drive2:* [*/option*]

Remarks

The first drive specifies the source disk, and the second drive specifies the target disk.

The disks that may be copied are 720KB, 1.2MB, and 1.44MB disks. Both the source disk and the target disk must be of the same type. If the target disk is unformatted, or has a different format, then it is reformatted before copying.

If any problem occurs during the copy process, DISKCOPY indicates the side, track, and sector where the problem occurred.

The source or the target disk may not be a RAM or virtual disk.

DISKCOPY copies only floppy disks, not hard disks.

Options

The /1 option copies only the first side of the disk.

The /V option verifies the copy after completion.

The /M option forces multi-pass copy using memory only.

Examples

```
DISKCOPY A: B:
```

Duplicates the contents of the disk in drive A: onto drive B:. Drive B: must support the same type of disk as drive A:.

```
DISKCOPY A: A:
```

Duplicates the contents of the disk in drive A:. You are prompted for swapping the source and target disk as needed to perform the entire copy.

DISPLAY

DISPLAY is a device driver that allows you to view international letters and symbols (code pages) on EGA and VGA displays.

Syntax

device =[*drive:*][*path*]DISPLAY.SYS *codepage*[*fontfilename*]

Remarks

DISPLAY immediately reconfigures your video adapter to display characters from the selected code page instead of those characters built into the hardware.

The *codepage* argument specifies the code page you wish to display. ROM-DOS supports code pages 437, 850, 852, 860, 863, 865, and 866.

The *fontfilename* argument, when included, tells ROM-DOS where to find the EGA.CPI or EGA3.CPI font file. EGA.CPI is the default file choice. If EGA.CPI is in the same directory as CONFIG.SYS, this can be omitted.

Currently, font information for all countries other than Russia and Czechoslovakia can be found in EGA.CPI. Russia's and Czechoslovakia's information is contained in EGA3.CPI.

For more information on DISPLAY, see the section on '**Configuring ROM-DOS for International Use**' on page 28.

Examples

```
device=DISPLAY.SYS 850
device=C:\DOS\DISPLAY.SYS 850 C:\DOS\EGA.CPI
```

These examples configure the video adapter to display code page 850. The second example is used if the DISPLAY.SYS and EGA.CPI files are in the C:\DOS directory instead of the same directory as CONFIG.SYS.

DUMP

DUMP is a utility that dumps out the contents of memory or the contents of a file.

Syntax

dump *filename* [*offset*] [*length*]

dump */address* [*length*]

Remarks

filename	The name of the file to dump.
offset	The offset into the file in hexadecimal to start dumping from.
length	The length of bytes in hexadecimal to dump.
address	The hexadecimal address in memory to start dumping from.

Examples

```
Dump myfile.txt 0 20
```

This will dump the first 20 hex bytes of MYFILE.TXT

EGA.CPI/EGA3.CPI

EGA.CPI and EGA3.CPI are font data files for use with the international video display driver, DISPLAY.SYS. These files contain alternate font sets to display in place of the hardware code page built into the EGA or VGA display monitor.

Syntax

Refer to the instructions for DISPLAY.SYS for usage.

Remarks

Currently, font information for all countries other than Russia and the Czechoslovakia can be found in the file EGA.CPI. Russia's and Czechoslovakia's information is contained in EGA3.CPI.

EMM386

The EMM386 device driver enables expanded memory support for systems capable of supporting expanded memory, such as the 386 and higher CPUs. HIMEM.SYS, or another extended memory specifications (XMS) manager, must be installed prior to EMM386.

Syntax (in CONFIG.SYS)

device=[*drive:*] [*path*] HIMEM.SYS

device=[*drive*:] [*path*] EMM386.EXE {I=xxxx-yyyy} {X=xxxx-yyyy} [FRAME=*seg*[,*memK*]]

[ROM=xxxx-yyyy] [D=xxx] [NOMOVEXBDA]

xxxx and yyyy define a range of memory. I= includes UMBs (Upper Memory Blocks) in that range. X= excludes UMBs in that range. ROM= creates ROM shadowing in that range.

Remarks

The HIMEM.SYS driver must be loaded for the EMM386 utility to function properly. Datalight's EMM386 supports Expanded Memory Services (EMS), Upper Memory Blocks (UMB), Virtual DMA Services (VDS), Virtual Control Program Interface (VCPI), and ROM shadowing.

MS-DOS checks for the presence of an XMS UMB provider after it loads any device. If such a device is found, it allocates all available UMBs, builds MCB chains within them, and records the fact that an upper memory chain is available in its SDA. However, ROM-DOS does not function in this manner. The Datalight EMM386 driver builds its own MCB chains within its allocated UMBs and sets up the previously-mentioned data structures with the help of the DOS kernel. Consequently, XMS UMBs that are made available by programs such as MS-DOS' EMM386.EXE are not recognized by ROM-DOS.

The *I=xxxx-yyyy* option tells EMM386 to include UMBs in the range specified by *xxxx-yyyy*. The *X= xxxx-yyyy* option tells EMM386 to exclude or **not** to make UMBs in a specified range. EMM386, by default, attempts to make UMBs in the range from C800-F800, excluding areas already occupied by ROM or RAM. Up to eight ranges can be specified. The range can be specified as an exact range, for example, D000 to DFFF or as the starting and ending marks for the range D000 to E000.

The *FRAME=* option defines the starting segment for four 16K pages that can be mapped in and out at will. The optional *memK* argument specifies how much memory to reserve for EMS. The default behavior is to allow all XMS memory to be used as EMS but also to share it, if not in use, with other processes such as Windows. The EMS memory is simulated using extended memory. The segment must be on an even 16K boundary. For example,

```
DEVICE = EMM386.EXE FRAME=E000,512
```

The above CONFIG.SYS statement allocates 512KB of extended memory to be used as EMS memory, with four Windows into that memory at E000:0. By default, EMM386 uses memory as requested for EMS up to the maximum in the system.

The *ROM=* option specifies a region of ROM to be supported by shadow RAM. This can speed up system performance if the BIOS resides in ROM and does not do its own ROM shadowing. As with all memory ranges, the range must begin and end on 4KB boundaries.

The *D=* option specifies the amount of RAM in kilobytes (specified as a base-10 number) that is to be reserved for a VDS buffer. The default value is zero. Values for the D= option must be between 16KB and 256KB and are rounded up to the nearest 4KB.

The NOMOVEXBDA option tells EMM386 not to move the Extended Bios Data Area from conventional memory to upper memory.

The *MAX=memk* option specifies the maximum amount of EMS memory in KB.

The *LOW* argument prevents the relocation of EMM386 into the first UMB with sufficient size to hold it. EMM386 remains in conventional memory, using approximately 20KB, but reserving UMB areas for use by other drivers.

The *PS2* argument forces EMM386 to use the PS2-style (port92h) A20 line control.

The *RAM* argument is included for compatibility and has no effect on the function or setup for EMM386.

Datalight's EMM386 contains auto detection of BIOS extensions. EMM386 automatically searches for UMBs in the range of C800-F800, similar to MS EMM386. It supports VCPI, VDS, and all Int 67H functions, shared XMS/EMS, and works with MS Windows. Datalight's EMM386.EXE is significantly smaller than other extended memory managers.

Datalight's EMM386 does not support reallocation of EMS pages. Only four map-able pages are supported. EMS handle 0 is not supported. LIM 3.2 contexts obtained through Int 67h function 47h share eight storage slots with EMS handle names.

Examples

```
DEVICE = EMM386.EXE I=C800-F000
```

Maps RAM from extended memory into the address C800:0 to just under F000:0 and defines an Upper Memory Block region there. The range could also have been specified as C800-EFFF. When no FRAME= option is supplied, neither EMS nor VCPI services are provided by EMM386.

```
DEVICE = EMM386.EXE I=C800-D7FF I=F000-F7FF FRAME=E000, 1024
```

Maps in RAM from extended memory into C800-D7FF and into F000-F7FF and define Upper Memory Block Regions there. Also, EMS support is allowed with four 16KB pages starting at E000:0 with 1024KB (1MG) worth of 16KB pages.

```
DEVICE = EMM386.EXE ROM=F000-FFFF
```

Specifies an address range for EMM386 to use for shadow RAM. The ROM represented by the address range is copied into RAM. The RAM area is remapped into the ROM address space and write protected. In this example, the BIOS that normally occupies the 64KB block at F000:0h is copied into RAM and run from there. This may speed up your system if it does not already make use of shadow RAM.

```
DEVICE = EMM386.EXE D=20
```

Sets aside 20KB of memory for Direct Memory Access (DMA). Another client, such as a network TSR, can then utilize this memory buffer for disk I/O.

EXE2BIN

EXE2BIN attempts to convert an executable file into a com file.

Syntax

```
EXE2BIN infile outfile
```

Remarks

The following must be true for the conversion to be successful: CS=DS=SS (Tiny Model) and there cannot be any segment fixups. Segment fixup addresses are contained in the .exe header so that variable sin the code will be set to contain the segment address which can only be known when DOS loads the file. COM files do not have a mechanism to do fixups.

Examples

```
EXE2BIN test.exe test.com
```

Convert the .exe file test.exe into test.com.

FDISK

The FDISK command initializes a hard disk for ROM-DOS to use. FDISK allows you to specify the number of logical drives that are available using a single or multiple physical hard disks. FDISK can be run from its menu or by command line arguments. FDISK supports drives that require LBA support.

Syntax

```
FDISK [drive number] [/3] [/C] [/I# [/N]] [/B|/R|/V] [/S#]
[/?]
```

Options

The *drive number* option specifies the BIOS drive number to use with other command line arguments. For hard drives, this number is 80h, 81h, and so on, depending on the number of hard drives and partitions in the system.

The /3 option enables FAT32 mode

The /B option creates a FAT16 partition and forces the update of the master boot record code.

The /C option causes FDISK to proceed without confirmation messages.

The /I# argument creates a Super-boot partition with an identification (ID) number of #. 98h is the default value for #.

The /N option prevents writing of the master boot record code for the Super-boot partitions.

The /R option refreshes the master boot record code only

The /S# option sets the partition size in MB. The default setting creates a partition as large as possible.

The /V argument displays the current partition information then exits.

Remarks

The FDISK command, when entered with no command line arguments, prompts with the command menu:

```
V) View partition(s)
R) Raw display of partition sectors
C) Create DOS partition(s)
P) Create Super-boot partition
D) Delete a partition
A) Delete all partitions
T) Toggle boot status
M) Write Master Boot Code
Q) Quit without saving
S) Save changes (and reboot)
```

Enter the letter that corresponds to your choice. If you make a mistake, press Esc to return to the previous menu.

Initialization of a hard disk is usually performed when it is first setup for use. Do this by using choice C (or possibly N). Choice C displays a description of available disk space and a recommendation for using that available space. Follow these recommendations to initialize a hard disk with as many 2GB partitions as possible.

If choice C indicates that the hard disk has partitions already, then they may be deleted if needed. The only reason for deleting partitions is to build smaller-sized partitions or fewer larger-sized partitions.

The M choice writes the code for the master boot record. By default, FDISK only writes the disk partition information. If FDISK finds that the Boot Code is invalid, it automatically writes the boot record. If the existing Boot Code appears valid, it is not rewritten unless you select the M option.

After completing all desired modifications and/or additions, select S to save changes. Once FDISK has modified the disk, the following message appears.

```
Press any key and ROM-DOS will reboot
```

After rebooting, each newly initialized drive must be formatted prior to use. Format only those drives that are new or have been resized. Formatting destroys any existing data.

If no changes were made with FDISK, or you wish to abandon the changes made, select Q to quit.

Examples

```
FDISK 81 /R /C
```

Refreshes the master boot record code on drive 81h without confirmation.

```
FDISK 80 /I98 /S5 /C
```

Creates a 5MB Super-boot partition with an ID of 98h and without confirmation.

```
FDISK 80 /S
```

Creates a partition that is as large as possible.

FIND

The FIND command displays lines, within a disk file, that contain a specified string of characters.

Syntax

FIND [/V] [/C] [/N] [/I] "*string*" [[*drive*:][*path*]*filename*[...]]

Options

The /C option displays only the count of lines found with the specified *string*.

The /N option displays the line number of the line found containing the *string*.

The /V option displays the lines that do not contain the string.

The /I option ignores the case of characters

The *string* argument specifies the string of characters to search for. Double quotes are required around the string.

The *filename* argument specifies the file or group of files to search in. The complete drive and path can be specified. Wildcard characters can be used in the *filename*.

Examples

```
FIND printf junk.c
```

Displays each line in the file JUNK.C that contains the *string* printf.

```
dir | FIND DIR
```

Displays each line in a directory listing that contains a DIR. The command first executes a DOS DIR command with the output piped into the FIND command. The FIND command then displays each line that contains the DIR *string*.

```
FIND /C ROM-DOS MANUAL.TXT
.....MANUAL.TXT: 105
```

Displays a count of the lines in the file MANUAL.TXT that contain the string ROM-DOS.

FORMAT

The FORMAT command initializes a disk so ROM-DOS can access files on that disk. A disk must be formatted before ROM-DOS can use it.

Syntax

FORMAT *drive*: [/V[:label]] [/Q] [/F:size] [/S] [/C]

FORMAT *drive*: [/V[:label]] [/Q] [/4 | /7] [/S] [/C]

FORMAT *drive*: [/Q] [/4 | /7] [/S] [/C]

Remarks

FORMAT initializes the disk and directory of the specified drive. The size of the formatted disk is the largest possible size that the specified drive supports, unless a different size is specified via a command line option.

Options

The *drive:* parameter specifies the drive letter to be formatted.

The /4 switch causes the floppy disk to be formatted as a 360KB disk even if the drive is a 1.44MB, 2.88MB, or 1.2MB drive.

The /7 switch causes the floppy disk to be formatted as a 720KB disk even if the drive is a 1.44MB or 2.88MB drive.

The /C switch causes FORMAT to format one disk without operator input. The disk is assumed to be in the specified drive, and FORMAT exits immediately when the format is

complete. This switch is useful in batch files or programs that require a formatted disk without user input.

The /F:*size* option specifies the size of the floppy disk to be formatted. Available size values are 360, 720, 1.2, 1.44, and 2.88, and are entered as /F:*size*. For example, /F:1.2.

The /H switch causes the system files not to be hidden or write-protected. This can be used along with the /S option.

The /Q option causes FORMAT to do a quick format. A quick format reinitializes the disk, deleting each file and subdirectory from the disk. A quick format can only be performed on a previously fully formatted disk.

The /S switch causes FORMAT to copy the ROM-DOS system files, ROM-DOS.SYS and COMMAND.COM, onto the disk. The file ROM-DOS.SYS is renamed and stored on the disk as files IBMBIO.COM and IBMDOS.COM, which are stored as hidden files, unless the /H option is used.

The /V:LABEL switch causes FORMAT to place a volume label on the disk. If the volume label is not provided on the command line, you are prompted for the volume label once the format is complete.

The /[switch causes FORMAT to run without display of the sign-on message.

HIMEM

The HIMEM.SYS device driver manages extended memory and the High Memory Area (HMA) in a 286, 386 or greater, or PS/2 systems. HIMEM prevents programs from simultaneously using the same area of memory for two different purposes. HIMEM supports the Extended Memory Specification (XMS) 2.0. HIMEM is installed as a device driver in CONFIG.SYS.

Syntax

DEVICE = [*drive:*][*path*] HIMEM.SYS [/machine:*n*] [/A20[+]] [/PS2] [/CONTROLA20:OFF] [/BIOS] [/QUIET]

Remarks

The HIMEM driver can be used to allow ROM-DOS to run in High Memory.

HIMEM supports a default of 32 handles.

HIMEM should not be used with older versions of Datalight's VDISK. Current versions of VDISK use XMS memory if it is available.

HIMEM recognizes PS/2-style A20 line control and determines whether to use the PS/2 A20 control or the AT A20 control method automatically by calling Int 15h, function C0h (get system configuration). This automatic detection can be overridden with the /Machine:*n*, /A20, A20+, or /PS2 command line switches in the event that the auto detection on a given system fails.

/Machine:1 and /A20 both designate the PC AT A20 control method. These switches instruct HIMEM *not* to wait for the A20 line to settle.

/Machine:2 and /PS2 both designate the PS/2 control method.

/A20+ is similar to /A20 but instructs HIMEM to wait for the A20 line to settle.

/Machine:3 designates support for the Phoenix Cascade BIOS A20 control methods.

Alternately, /CONTROLA20:OFF instructs HIMEM to *not* detect the control method for the A20 line and assumes the A20 line is always on.

The /BIOS switch forces the use of BIOS Int15h, Function 87h, for data transfers to and from XMS memory.

The /QUIET switch forces HIMEM to remove the sign-on message when loading.

Error Conditions

No Extended Memory—An extended memory error condition can occur if the BIOS (via Int 15H, function 88H) notifies HIMEM that there is no extended memory. In this situation, HIMEM displays an appropriate error message and does not install.

Failure to Control the A20 Line—When HIMEM installs, it attempts to control the A20 line, which controls access to the HMA. HIMEM first attempts control via the AT method (using the 8259 keyboard control). If that fails, HIMEM then attempts control via the PS/2 method (using I/O port 60H). If both methods fail, HIMEM assumes it can't control the A20 line and displays the message

```
A20 Control (OFF)
```

If either of these errors occur, try using the /A20, /A20+, or /PS2 in the HIMEM command line.

Note also that some older programs assume that the machine is a 1MB 8086 and so require that the A20 line to be disabled (OFF) while they run. Current programs typically do not require that the A20 line be disabled.

Examples

```
Device = C:\DOS\HIMEM.SYS
```

Installs the XMS device driver. Once this driver is installed, accessing the HMA and Extended Memory (XMS) memory areas are legal. The Extended Memory area can contain up to 2GB of memory. Typical systems have 4, 8, or 16MB of XMS memory installed.

```
Device = C:\DOS\HIMEM.SYS /machine:1
```

Forces the use of the AT-style A20 line control.

The HIMEM driver fails to load when either the machine does not have memory above the 1MB boundary or the BIOS does not provide support for it. It also fails to load when another XMS manager has been previously installed.

KEYB

The KEYB command allows you to alter the keyboard layout for a different language or nationality.

Syntax

KEYB

KEYB *countryid*

KEYB *countryid*,[*codepage*],[*keyboard filename*]

Remarks

KEYB is a terminate and stay resident program (TSR). Running KEYB with no arguments shows the current settings of a resident copy of KEYB, if there is one.

The *countryid* argument is a two-letter code that specifies which country, region, or language is to become current.

When no *codepage* is included, KEYB uses the default code page for the *countryid*. You can specify either the default or the alternate code page for any *countryid*.

The *keyboard filename* argument tells KEYB where to find its data file (KEYBOARD.SYS or KEYBRD2.SYS). When no *keyboard filename* is given, KEYB first looks for KEYBOARD.SYS in the current directory, then in the directory containing KEYB.COM.

Currently, keyboard data for all countries except Russia and Czechoslovakia are found in KEYBOARD.SYS. The file KEYBRD2.SYS contains the data for Russia and Czechoslovakia.

Refer to the table on page 31 for a list of the supported *countryid* codes, along with their default and alternate code pages.

If a copy of KEYB has already been run, it is reconfigured to the new specifications. While KEYB is active, you can switch back to a U.S. layout at any time by pressing Ctrl+Alt+F1 (Alt+Left-Shift for Russian and Czech Republic keyboards). You can toggle back to the alternate layout by pressing Ctrl+Alt+F2 (Alt+Right-Shift for Russian and Czech Republic keyboards).

Examples

```
KEYB GR
KEYB GR,437
KEYB GR,,C:\TOOLS\KEYBOARD.SYS
```

Each of these commands establishes a German keyboard layout. The first and third use code page 850, while the second uses code page 437. In the third case, the KEYBOARD.SYS file is located in the C:\TOOLS directory.

KEYBOARD & KEYBRD2

KEYBOARD.SYS and KEYBRD2.SYS are keyboard code page data files for use with the international keyboard driver, KEYB.COM.

Syntax

Refer to KEYB.COM for usage instructions.

Remarks

Currently , keyboard date for all countries except Russia and Czechoslovakia are found in KEYBOARD.SYS. The file KEYBRD2.SYS contains the data for Russia and Czechoslovakia.

LABEL

The LABEL command sets or deletes a disk volume label.

Syntax

LABEL [*drive:*] [*volume string*]

Remarks

The *volume string* may be up to 11 characters in length. LABEL only uses the first 11 characters of a volume label. The characters that are acceptable in a *volume string* are the same as those for a filename.

LABEL prompts as follows. Enter the new label and press enter to modify the existing label.

```
Volume in drive C is xxxxxxxxxxx

Volume label (11 characters, ENTER for none)?
```

If a volume label has previously been assigned to a disk, and you do not enter a new volume label, the following message is printed.

```
Delete current volume label (Y/N)?
```

If the disk did not have a volume label prior to running the LABEL command, the above message will not appear.

Example

```
LABEL a:
```

LABEL displays the volume label of drive A:, if one exists, and allows it to be modified or deleted.

MEM

The MEM command displays the used and free memory in your system.

Syntax

MEM [/B | /C | /R]

Remarks

Options	Description
/B	Displays each BIOS extension and its size.
/C	Classifies the memory usage.
/R	Does raw dump of the MCB chain.

MEM displays a list of the DOS memory contents, what free space is available, and how much memory is in conventional memory, upper memory, the HMA and extended memory. This program is useful to fine tune the system to have as much free memory as possible for applications.

Options

The /B option displays BIOS extensions in the range from C000:0 to F800:0.

The /C option shows program, TSR, and device driver sizes.

The /R option shows a low-level DOS listing of MCBs (Memory Control Blocks).

MODE

The MODE command modifies the operation of the printer, serial port, and active video display.

Syntax

MODE LPT#[:]=COM#[:]

MODE COM#:*baud*[,*parity*[,*databits*[,*stopbits*[,*P*]]]]

MODE *video mode*

MODE *display lines*

Remarks

The first syntax above redirects line printer output to the serial port.

The second syntax above changes the operation of the specified communications port. The options that can be modified are listed below. Invalid values for any of the options are flagged with an error message.

```
baud       110, 150, 300, 600, 1200, 2400, 4800, 9600
parity     N - None, O - Odd, E - Even
databits   Either 7 or 8
stopbits   Either 1 or 2 stop bits
P          Printer Port
```

Using the P option as the last argument causes output to be sent repeatedly to the printer port until successfully received. Without the P, output is sent only once, causing a critical error if unsuccessful.

The third syntax changes the active *video mode* for the display terminal. The valid choices for this version of the MODE command are as follows:

40 — Indicates 40 characters per line.

80 — Indicates 80 characters per line.

bw40 — For a color graphics adapter with color disabled and 40 characters per line.

bw80 — For a color graphics adapter with color disabled and 80 characters per line.

co40 — Indicates a color monitor with color enabled and 40 characters per line.

co80 — Indicates a color monitor with color enabled and 80 characters per line.

mono — For a monochrome display. Assumes 80 characters per line.

The final syntax sets the number of *display lines*. Valid values included L25, L43, and L50.

Note: A serial port should be initialized before an LPT device is redirected to it.

Examples

```
MODE COM1:9600,n,8,1
```

Modifies the settings for the COM1 device to a baud rate of 9600, no parity, eight data bits, and one stop bit.

```
MODE LPT2:=COM2
```

Redirects the output from LPT2 to the COM2 serial port. All following output to LPT2 actually goes to the COM2 device.

```
MODE mono
```

Indicates a monochrome display adapter.

MORE

The MORE command displays a text file one screen at a time.

Syntax

MORE [*filename*]

or

command | MORE

Remarks

The input to MORE may come from a file, or it may be piped in from another filter or any other DOS *command*. If the *filename* is present, then the file is viewed; otherwise MORE reads from the Standard Input.

Once a screen has been viewed, a line is displayed on the bottom of the screen indicating the percent of the file that has been viewed. At this point, there are several options for the next lines of text to be viewed.

B	Display the previous full page.
<enter>	Display just one more line.
T	Display starting at the top of the file.
Spacebar	Display the next full page of text.
Q	Exit MORE

Examples

```
DIR | MORE
```

Displays a directory one screen at a time.

```
MORE READ.ME
```

Displays the file READ.ME one page at a time.

MOVE

The MOVE command moves files and renames files and directories.

Syntax

To move one or more files:

MOVE [/Y | /-Y] [*drive*:][*path*]*filename1*[,...] *destination*

To rename a directory:

MOVE [/Y | /-Y] [*drive*:][*path*]*dirname1 dirname2*

Remarks

[*drive*:][*path*]*filename1* specifies the location and name of the file or files you want to move.

destination specifies the new location of the file. Destination can consist of a drive letter and colon, a directory name, or a combination. If you are moving only one file, you can also include a filename if you want to rename the file when you move it.

For renaming a directory:

[*drive*:][*path*]*dirname1* specifies the directory you want to rename.

dirname2 specifies the new name of the directory.

Options

/Y suppresses prompting to confirm creation of a directory or overwriting of the destination.

/-Y causes prompting to confirm creation of a directory or overwriting of the destination. The /Y option may be present in the COPYCMD environment variable. This may be overridden with /-Y on the command line.

MSCDEX

The Datalight CD-ROM driver enables CD-ROM drives.

Syntax

MSCDEX [*options*]

Remarks

Options	Description
/D:<Name>	CD-ROM device name (default MSC002)
/E	Use extended memory for CD-ROM buffers
/H	Displays the help screen
/K	Allow Kanji with the CD-ROM volumes
/L:<Letter>	Specifies the drive letter for CD-ROM drive
/M:<Number>	Specifies the number of sector buffers (default 4)
/V	Directs MSCDEX to display momory statics when it starts

A low-level driver from the CD-ROM drive manufacturer interfaces to the actual CD-ROM hardware while the Datalight CD-ROM driver provides the interface between ROM-DOS and that hardware driver. This interface is called the Microsoft CD-ROM extensions (or MSCDEX).

For each hardware driver loaded, use the /D: option to specify the name of that driver. The default name is MSC002.

The /L: option specifies the drive letter to use for the CD-ROM drive. The default driver letter is the next available. To increase the number of available drive letters, use the LASTDRIVE command in CONFIG.SYS.

The /M: option specifies the number of buffers to use to speed up CD-ROM drive access.

The /X option puts those buffers in extended memory rather than conventional memory.

Examples

```
MSCDEX /D:MSC003
```

Installs the CD-ROM driver using MSCD003 as the device name.

```
MSCDEX /L:G
```

Installs the CD-ROM driver using G as drive letter.

```
MSCDEX /M:6 /X
```

Installs the CD-ROM driver using six buffers allocated in XMS.

NED

The NED editor is a menu-based text editor available for use with ROM-DOS. This editor is similar to other desktop editors but has special functions designed for use in editing C-source and assembly code.

Starting the Editor

To start the editor, enter

```
NED [filename] [filename]
```

NED may be initiated with or without filename arguments. Wildcard file specifications are allowed.

Up to ten files can be entered on the command line. If NED is run without arguments, it loads all files accessed during the last editing session, returning you to the exact position in the file. You can switch between the open files.

You can also enter

```
NED @errfile
```

where *errfile* is the name of your compiler error output file. NED loads all files that had errors and allows you to move between errors.

Once NED is running, you may load files into memory by using the File/Open menu command. File/Reload replaces the current file with a new file or reloads a new copy of the same file. File/Reload confirms before replacing an unsaved file.

Basic Editor Operation

NED uses the standard Windows interface for cut, copy, and paste operations. Del and Shift+Del both move the selected block to the clipboard. There is no true undo command, but Ctrl+V or Shift+Ins may be used to paste the clipboard contents to the current cursor position. Table 1 lists the all the default shortcut keys.

If a search string is all lowercase, NED treats it as a case-insensitive search. If a search string contains any uppercase letters, it is case sensitive. The replacement string is inserted exactly as entered. Repeating a Search command repeats the last Forward or Backward Search operation, not the last Replace operation.

There is one bookmark for all files. Once the bookmark is set, going to the bookmark returns you to the file and position where you set it.

The Indent and Remove-indent (referred to as Undent in the Options/Do Command) commands work on tabs. Indent inserts a tab at the beginning of the current line, or if a block is active, at the beginning of each line in the block. Remove-indent removes the first tab from the current line or from each line in the block. If there are no tabs, Remove-indent has no effect.

Toggle case inverts the case of the current character if no block is active. If a block is active, Toggle case sets the entire block to uppercase if the first character was lowercase, and to lowercase if the first character was uppercase.

Tabs are currently set to 3 for .C, .H, .CPP, .HPP, and .T files. They are set to 8 for all other files.

File/Print prints the current block if there is one, otherwise it prints the current file. NED prompts for a device to print to, which may be a filename. Tabs are expanded to spaces.

The Options/Do Command is intended primarily for debugging. This command allows you to execute any editor command by choosing it from a menu list.

The macro commands (Record Macro/Play Macro) allow you to define a sequence of keystrokes that can be repeated over and over. Select Record Macro (ALT=), enter the keystrokes, then press ALT= again. The macro sequence can be played by selecting Play Macro or by pressing ALT. Keyboard bindings are saved in NED.CFG in the same directory as NED.EXE. NED.CFG also contains the list of active files and positions.

If you record and play a recursive macro, it plays continuously.

If you press an invalid key on a menu, NED operates as if you pressed enter.

If you run out of memory, such as when you have more than 300KB of files open, NED returns to DOS.

Remote Editing

NED operates as a full-screen editor, even through a serial port using ANSI Escape codes. Any communication program capable of emulating an ANSI terminal will work with NED in remote mode.

NED automatically detects if the console is redirected through a serial port, either via CTTY, or when a serial console. NED does not support ANSI key codes, so the use of PC function keys and standard PC cursor keys is supported through control keys. To use the special control keys, copy the NEDREMOT.CFG to the name NED.CFG in the same directory that NED.EXE is run from on the target system. This NED configuration file was created using the “Map a key” function (under the Options menu), and can be modified in the same manner.

Always use the Esc key to get to the menus. Use Ctrl+K to enable/disable blocking mode when selecting text. The remote key mapping is provided in the following list.

Ctrl+A	Left arrow
Ctrl+B	Find backward

Ctrl+C	Copy to clipboard
Ctrl+D	Go to mark
Ctrl+E	Delete to end of line
Ctrl+F	Find forward
Ctrl+G	Go to line number
Ctrl+H	Delete previous character (same as Backspace)
Ctrl+I	Insert tab (same as Tab)
Ctrl+J	Page down
Ctrl+K	Toggle block mode (for cutting to clipboard)
Ctrl+L	Delete the entire line
Ctrl+M	Insert return (same as Enter)
Ctrl+N	Toggle insert/overwrite mode
Ctrl+O	Open a file
Ctrl+P	Toggle through previous 3 positions
Ctrl+Q	Home
Ctrl+R	Search/Replace
Ctrl+S	Right arrow
Ctrl+T	Top of document
Ctrl+U	Page up
Ctrl+V	Insert clipboard at cursor
Ctrl+W	Up arrow
Ctrl+X	Delete to clipboard
Ctrl+Y	End of document
Ctrl+Z	Down arrow
Ctrl+[	Menu/Cancel operation (same as Esc)
Ctrl+]	Brace match
Ctrl+\	Do a command (opens a menu with all NED commands)

Troubleshooting Remote NED

If nothing appears on the terminal screen, check the baud rate of the terminal program, check the serial cable (it should normally be a null-modem cable), and check that the terminal program is set to emulate ANSI escape codes.

In some cases, it is possible for the remote auto-detect to fail. In this case, run the program NEDREMOT prior to running NED. NEDREMOT sets a word at 40:E8h to inform NED to operate remotely.

Default Hot Keys

Many of the editor commands can be accessed directly by pressing key combinations. For example, press Alt+X to exit the editor and save any open files. The following table lists the default hot keys. You can redefine the commands and keys using the Bind HotKey command available on the Options Menu.

Key	Function	Key	Function
Alt+Q	Quit without saving	F1	Help
Alt+X	Exit, saving as needed	F7	Load file into current buffer
Ctrl+A	Search again	F9	Save file
Ctrl+B	Search backward	F10	Exit asking for save as needed
Ctrl+C	Copy the block to clipboard	Left Arrow	Left one character
Ctrl+D	Find the mark	Right Arrow	Right one character
Ctrl+E	Erase to end-of-line	Up Arrow	Up one line
Ctrl+F	Search forward	Down Arrow	Down one line
Ctrl+G	Go to a line number	Home	Beginning of line
Ctrl+I	Indent the block	End	End of line
Ctrl+K	Toggle block mode	Page Up	Up one screen
Ctrl+L	Delete line to the clipboard	Page Down	Down one screen
Ctrl+M	Set the mark	Center (5)	Center the cursor onscreen
Ctrl+N	Read a file into a new buffer	Ctrl+Left Arrow	Left one word
Ctrl+P	Move to the previous position	Ctrl+Right Arrow	Right one word
Ctrl+Q	Quote the next character	Ctrl+Up Arrow	Up one C function
Ctrl+R	Replace text	Ctrl+Down Arrow	Down one C function
Ctrl+S	Switch to the next buffer	Ctrl+Home	Scroll toward beginning of file
Ctrl+T	Toggle the case of character(s)	Ctrl+End	Scroll toward end of file
Ctrl+U	Remove indent from the block	Ctrl+Page Up	Beginning of file
Ctrl+V	Insert the clipboard	Ctrl+Page Down	End of file
Ctrl+W	Delete word to the clipboard	Ins	Toggle Insert/Overwrite mode
Ctrl+X	Delete block to the clipboard	Del	Delete character
Ctrl+Z	Cancel the selected block	Backspace	Delete character backward
Alt =	Start/end recording macro	Ctrl+Ins	Copy block to clipboard
Alt -	Playback macro	Ctrl+ BackSpace	Delete word backward
Alt+F7	Previous error	Shift+Ins	Insert the clipboard
Alt+F8	Next error	Shift+Del	Delete block to clipboard

POWER

POWER.EXE conserves power on a system that has APM (Advanced Power Management) by shutting down various subsystems (screen, disk drives, etc.) that are not being used. POWER.EXE can be used in an INSTALL command in CONFIG.SYS, in AUTOEXEC.BAT or on the command line.

Syntax

From command line or AUTOEXEC.BAT, enter

[*path*]power[*options*]

From CONFIG.SYS, enter

Install=[*path*]power[*options*]

Remarks

The system BIOS must support the following APM functions for POWER.EXE to work.

Function	Description
00	APM Installed
01	Connect
04	Disconnect
05	CPU idle
06	CPU busy
07	Set Power State
08	Get PM Event

For each device, you can specify the length of time that the device must be inactive before it is turned off. If you specify a length of zero for a device, POWER.EXE disables power management for that device.

The (#) argument for each command option defines the number of seconds the device can remain inactive before it is powered down.

Options

The /C# option sets the inactive time for the COM ports. The default value is two seconds.

The /D# option sets the inactive time for the disks. The default value is 30 seconds. Currently, all disk drives are treated as a single device.

The /P# option sets the inactive time for printers. The default time is two seconds.

The /S# option sets the inactive time for the screen. The default time is nine seconds.

The /H option displays a user help screen.

The /K options sets the keyboard time.

The /ADV:MIN argument provides the minimum (most responsive) power reduction.

The /ADV:REG argument provides the standard power reduction.

The /ADV:MAX argument provides the maximum (least responsive) power reduction.

The /STD argument provides the standard power reduction.

The /OFF argument turns power management off.

Example

```
POWER /S20 /C0 /P0
```

Runs POWER, turning off the screen after 20 seconds of inactivity, never turning off the COM and printer ports, and uses the default inactivity period for the disk drives (30 seconds) and keyboard.

PROTO

PROTO creates function prototypes in C language files.

Syntax

```
PROTO filename [filenames]
```

Remarks

The start of the function must begin with the first character in a new line. A simple space can cause the function prototype for this function to be overlooked. Which can be useful under certain circumstances. In order to have proto create function prototypes for any assembly files there must be a multi-line comment (see below) with a c-style function description.

```
C language file :
unsigned MultiplyTwoBytes( unsigned char ucValue1, unsigned char
ucValue2) {
...
}
Assembly Language (ASM)file:
comment ~
unsigned MultiplyTwoBytes( unsigned char ucValue1, unsigned
char ucValue2) {}
~
Public MultiplyTwoBytes
MultiplyTwoBytes proc
...
MultiplyTwoBytes endp
```

The prototypes are only displayed to the screen so the user can redirect them where they want.

Proto takes every option on the command line and assumes that it is a filename. Therefore you can specify multiple filenames on the command line. Wildcard characters are allowed in the filenames.

Note

At the time this manual was updated, this utility did not contain long filename support.

Examples

```
PROTO hello.c hello.asm >hello.h
```

Create a prototype listing in the output file hello.h from the files hello.c and hello.asm.

```
PROTO test*.c >test.h
```

Create a prototype listing in the output file test.h from all of the files matching the name mask of test*.c in the current directory.

RESTORE

The RESTORE command is the complement program to BACKUP. It restores files previously saved with BACKUP to the hard disk.

Syntax

RESTORE *srcdrive* [*dstpath*] [options]

Remarks

Option	Description
/D	Show directory of files in backup volume(s).
/P	Prompt only if destination file already exists and is a hidden, system, or read-only file, or is marked as changed. Do not prompt on unchanged existing files.
/S	Restore all subdirectories.
/Y	Answer Yes to all prompts.

The *srcdrive* is the drive to restore from and may include an optional file mask. For example, RESTORE A:*.C restores only those files ending with .C from the backup set in drive A:.

The *dstpath* must be a DOS destination path. If no destination path is given, RESTORE assumes the current directory. The destination may contain wildcards (which override wildcards placed in the *srcdrive* option.

Note

At the time this manual was updated, this utility did not contain long filename support.

Options

The /D option just displays a directory of what files are in the backup set, similar to DIR. This is useful if you are not sure what files or dates/times are in the backup set.

The /S option restores from subdirectories as well.

The /Y option is useful when running RESTORE from a batch file. Any entire set from another hard drive or network drive can be restored without user input.

Examples

```
RESTORE A: /D
```

Displays files in the backup.

```
RESTORE A: D:TEMP\fx*.fh /S
```

Completes restore, with subdirectories, of all files whose filenames begin with fx and have a .fh file extension.

```
RESTORE B:*.c /S
```

Restores only files with a .C file extension to the current directory.

RSZ

RSZ.EXE is a Zmodem file transfer utility used to transfer files over a serial port to another machine running the Zmodem file transfer protocol. RSZ.EXE can be used in place of the COMM program and can be started from within a DOS batch file to send and receive files. In addition, RSZ.EXE does not require that the system have a video display as does the COMM program. RSZ.EXE uses approximately 24KB of RAM.

Syntax

RSZ /Pn [/Inn] /Bn /Hn /Fn [/Q] [/V] /[R|[S *file1* [*file2* ...]]]

Some examples of RSZ usage include:

```
RSZ /R
RSZ /P3 /B115200 /H2 /C /F0 /S a.b lmno.p z.*
```

RSZ Program Options

All command line options must be separated by a space.

Option	Description
/P	Port number:n = 1, 2, 3, or 4 for COM1 to COM4 (default setting is 1 for COM1).
/B	Baud rate:n = 50,110,300,..115200.
	Always N81 when changed. If this option is not specified, program uses the current port parameters.
/I*nn*	IRQ Numbers – valid IRQ selections are 3 – 15. Default value for COM2 and COM4 is IRQ3; the default value for COM1 and COM3 it is IRQ4.
/H	Handshaking options.
	Both sides must use the same value: 0 = none (default), 1 = software, 2 = hardware.
/F	File management options (all files are binary):
	0 = skip, 1 = resume, 2 = make duplicate, 3 = replace (default)
/R	Receive files specified by sender using Zmodem protocol.
/S	Send the specified files using Zmodem protocol. Wildcards are allowed.
/V	Verbose switch forces the status display to ON when the console is redirected to a second COM port, and allows the Esc key to break out of a transfer.
	Esc will not work when RSZ is using the same COM port as the remote console.
/Q	Do not display/send status information while transferring files. This option is automatically selected when running CTTY.

File Transfer Recovery

For Zmodem file transfer recovery to work after a failed transfer, you must use RSZ with the /F1 option on the receiver command line. This option selects the resume file management option.

Time Zones

An additional environment variable for time zones is also supported. The TZ variable allows you compensate for time zone differences when sending and receiving files and when the time stamp on a received file is critical. This variable only affects transfers done with the Z-modem protocol. X-modem transfers are not affected. By default, if no time zone is set, the Datalight utilities COMM and RSZ assume Greenwich Mean Time (GMT).

Setting the TZ variable is not necessary when using all programs. If you are transferring files between two Datalight utilities, the file time stamp is not affected. Some utilities, such as Windows HyperTerminal, automatically convert the time stamp on the file to GMT and assumes that the receiving program will adjust the time to the correct local time upon receipt.

The syntax for the TZ environment variable is:

SET TZ= <*abbreviation*> +|- *value*

Abbreviation represents any three-letter abbreviation for the chosen time zone. The variable serves as a reminder to the user. For example, if setting the time zone for Pacific Standard Time, the variable could be set as PST and for Eastern Standard Time as EST. The abbreviation is only a placeholder in the syntax for the TZ variable. There are no incorrect abbreviation choices as long as only three letters are used.

Value represents the number of hours this time zone varies from GMT. For example, the west coast of the United States and Canada is –8 hours relative to GMT. This value may have to be adjusted to compensate for daylight savings time. There should be no spaces between the abbreviation, plus or minus sign, and the value. Some examples are:

```
SET TZ=PST -8
SET TZ=CMT -3
SET TZ=GMT+2
```

If an incorrect format for the time zone is entered, the default of GMT is used.

On a desktop PC running Windows programs, such as HyperTerminal, determining the time zone is part of the setup of the operating system. However, if COMM is run from a DOS box, the TZ variable still will need to be set on the target machine.

SHARE

The SHARE command installs the capabilities for file sharing and file locking on your hard disk.

Syntax

SHARE [/L:*nn*][/u]

Or from CONFIG.SYS

INSTALL=[*drive:*][*path*]SHARE.EXE [/*options*]

Remarks

The SHARE utility is most commonly used in a network or multitasking environment where file sharing is necessary. When SHARE is loaded, DOS utilizes the SHARE utility to validate read and write requests from application programs and users.

Note

At the time this manual was updated, this utility did not contain long filename support.

SHARE should not be used under DOS 7.1. With the addition of FAT32 support to DOS 7.1, the internal DOS share tables were overwritten.

Options

The /L:*nn* option specifies the maximum number of files that can be locked at one time. The default number is 20.

The /U option unloads the share utility and frees the memory. SHARE does not unload if other TSRs have been loaded on top of it. The other TSRs must be unloaded first before trying to unload SHARE.

Examples

```
SHARE
```

Loads the SHARE program from the command line.

```
INSTALL=C:\UTILS\SHARE.EXE /l:30
```

Installs SHARE from the CONFIG.SYS file and changes the maximum number of locked files to 30.

```
SHARE /U
```

Unloads SHARE and frees the used memory.

SMARTDRV

The SMARTDRV command provides disk and diskette cacheing. This is a memory resident program that speeds up your system's performance by reducing the number of times that an application has to physically access the disk. Datalight's SMARTDRV is fully compatible with Microsoft's documented SMARTDRV API (application programming interface).

Syntax

SMARTDRV [/X] [[drive[+|-]]...] [/U] [/C | /R] [/F | /N] [/V | /Q | /S] [InitCacheSize] [/E:ElementSize] [/B:BufferSize]

Remarks

To cache MSCDEX performance, you must load that driver first.

Options

Option	Description
drive [+|-]	Sets caching options on the specified drive, which will have write-caching disabled unless you specify a '+'. Specifying a '-' will disable all caching for that drive.
/X	Disable write-behind caching for all drives.
/U	Don't load the CD-ROM caching module.
/C	Writes all information currently in the write-cache to the disk.
/R	Clears the cache and restarts the SMARTDRV program.

Option	Description
/F	Writes the cached data before the command prompt returns (default).
/N	Doesn't write the cached data before the command prompt returns.
/V	Displays the Verbose status messages when loading the cache.
/Q	Does not display any messages while loading, aka Quiet mode (default).
/S	Displays information about the current status of the cache.
InitCacheSize	Specifies the amount of XMS memory (KB) for the cache.
/E: ElementSize	Specifies how many bytes of information to move at one time.
/B: BufferSize	Specifies the size of the read-ahead buffer.

Example

The first example enables a write-cached drive C, a read-only cached drives D and Q – the latter being a CD-ROM drive. Note that drive A is also read-cached, even though it was not specified on the command line. The second example shows the results of a status report.

SMARTDRV C+ D Q /V 2048 /E:2048 /B:4096

then

SMARTDRV /S

SORT

The SORT command sorts a text file and displays the output to the standard device.

Syntax

SORT [/R] [/+n] [[*drive1*:][*path1*]*filename1*] [> [*drive2*:][*path2*]*filename2*]

or

command | SORT [/R] [/+n] [> [*drive2*:][*path2*]*filename2*]

Remarks

SORT normally starts its comparisons at the first character in a line.

The /+n option is zero justified, the first character in file is at position zero. To sort on the third character in line you would use /+2.

The input to SORT may come from a file, or it may be piped in from another filter or any other DOS *command*.

Options

The /+n option causes SORT to begin its alphabetical sorting starting at the n^{th} position in the string.

The /r option causes SORT to sort in the reverse alphabetical order.

Examples

```
SORT NAMES.LST
```

Sorts the file NAMES.LST and displays the output to the screen.

```
DIR | SORT /+14 | MORE
```

Produces a directory and then sorts the directory by file size (the file size in a directory display starts on the 14th position in each line or string). The output display is then shown one screen at a time using the MORE command.

STACKDEV

The STACKDEV.SYS command is used to increase the number of stacks available for IRQ handlers and Int13h. The standard STACKS= command for ROM-DOS increases stack space for the DOS stacks only.

Syntax

DEVICE=STACKDEV.SYS

Remarks

Under various conditions, a stack overflow error occurs while booting ROM-DOS, usually during the CONFIG.SYS or AUTOEXEC.BAT file processing. For example, some other program may service an interrupt and not provide its own stack for that purpose. If, inside its interrupt handler, the program consumes a lot of stack space by allocating many automatic variables, calling other interrupt handlers, or by deeply nesting sub-routines, then the interrupt handler may overflow the stack of the program that it interrupted. This situation usually results in a system crash.

The STACKDEV.SYS device driver handles stack support similar to MS-DOS' internal Stacks support. STACKDEV increases the stack space available for IRQ handlers and Int13h by switching to a local stack each time an interrupt occurs. STACKDEV does not allocate the stacks from a pool, instead, each interrupt on the list is given exactly one stack with a fixed stack size of 128 bytes.

STACKDEV differs from the internal STACKS= support with ROM-DOS in that the STACKS= command is used to allocate stack space for ROM-DOS' own internal stacks and does not add additional stack support for IRQs.

Examples

```
DEVICE = STACKDEV.SYS
```

Loads the STACKDEV.SYS device driver during CONFIG.SYS processing. This driver should be loaded early in the file so that it can handle the IRQ stack needs of other device drivers or programs.

SUBST

The SUBST command allows one drive to appear as another drive. This is useful for creating a consistent drive letter when the drive and/or path may change.

Syntax

SUBST [*drive1*: [*drive2*:]*path*]

SUBST *drive1*: /D

Options

The /D switch disables the substituted drive letter (un-installs it).

The *drive1* argument must be currently unassigned and non-substituted.

The *drive2* and *path* arguments must be a valid drive and/or directory.

Remarks

SUBST without any options displays the currently substituted drives. The path may be any legal DOS path, including network drives. DOS by default will not reserve room for extra drive letters. The LASTDRIVE command will be required to make available extra drive letters.

Examples

```
SUBST e: b:\subdir
```

SUBSTitute drive E: to use B:\SUBDIR

```
SUBST
```

Displays all SUBSTituted drives.

```
SUBST e: /D
```

Drive E: is no longer SUBSTituted.

SYS

The SYS command copies the ROM-DOS system files ROM-DOS.SYS and COMMAND.COM from the disk in the default drive to the disk in the specified drive. The file ROM-DOS.SYS is renamed and stored on the disk as files IBMBIO.COM and IBMDOS.COM, which are stored as hidden files.

Syntax

SYS *drive:* [*/options*]

Remarks

Use the SYS command to transfer the ROM-DOS system files to a floppy disk or hard disk. The disk can be a formatted blank disk or can contain files; it is not necessary for the system files to be the first files on the disk. The only requirement is that there is enough contiguous free space on the disk for the new system files to be placed. If the disk already contains system files, installing the new system files deletes the existing files.

The command processor, COMMAND.COM, is also transferred to the disk and does not need to be copied into the same contiguous space as the system files.

You can run SYS three different ways. The first is to boot and run your system with ROM-DOS. When you run the SYS command this way, SYS copies the ROM-DOS system files and COMMAND.COM from the root directory of the default/current disk drive.

The second method is to run SYS from the root directory of a disk drive that has been previously prepared with the SYS command, but isn't booted and running. For example, you can run SYS from a bootable floppy disk to copy the files to the hard disk without actually booting from the floppy disk itself.

The third method uses the file ROM-DOS.SYS, the equivalent of the hidden system files IBMBIO.COM and IBMDOS.COM. ROM-DOS.SYS should be present in the same directory with COMMAND.COM and SYS.COM. These three files can be placed in the root directory or subdirectory on a floppy disk (that need not be booted or bootable), or in a subdirectory on the hard drive. Run the SYS command from the directory where the files reside to transfer the system files to the destination drive.

Options

The /C option prevents confirmation before transferring system files.

The /H option does not hide newly transferred system files.

The /[option prevents display of the sign-on message.

Example

```
SYS B:
```

Copies the ROM-DOS system files to drive B:.

TRANSFER

TRANSFER is a file-exchange utility that allows embedded systems to upload and download files over a serial link using the XMODEM protocol. The program running on the host system may be either the COMM terminal program, another of Datalight's serial communications utilities, or another instance of TRANSFER. Refer to '**COMM**' for information regarding the COMM program.

In systems where the BIOS supplies a serial port console, TRANSFER uses BIOS Int 10h function 0Eh and Int 16h functions 0 and 1 to transfer files. In systems having a BIOS that does not supply a remote console, TRANSFER may also be used to transfer files over the same serial link as that used for the CTTY console. A specific serial port (COM1, COM2, and so on) can also be specified for TRANSFER to use for file transfers.

To move a file between systems, run TRANSFER on the target system. Either TRANSFER or COMM may be run on the host PC. If COMM is running on the host PC, press the PgUp key on the PC for COMM to send a file to the target system. COMM prompts for the filename and the protocol for TRANSFER; specify the Xmodem protocol. If you are using TRANSFER on the host PC, select the COM port, the baud rate, and specify either send or receive.

Run TRANSFER as follows:

```
A>TRANSFER [options] filename
```

The *filename* parameter specifies the file to be uploaded or downloaded. A path and drive letter may precede the filename. Wildcards are not allowed in the f*ilename* parameter.

The *options* for TRANSFER are listed in the following table.

Option	Description
/S	Sends a file.
/R	Receives a file.
/B#	Sets the baud rate. The *rate* number may be 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. The default rate is 9600.
	Specifying the baud rate causes TRANSFER to use a serial port rather than the default console.
	The default port is COM1; it can be changed using the /COM option.
/BC	Uses the BIOS console to transfer files (instead of CTTY).
/COM#	The /COM# tells TRANSFER not to disable use of the console, and allows the user to select the COM port.
	The COM number (#) may be either 1, 2, 3 or 4.
	This option (as well as /B#) causes TRANSFER to use interrupt driven serial I/O.
	An INS8250/16450/16550 or compatible UART is assumed at standard PC addresses.
	If the baud rate option is not used along with the /COM option, the default baud rate is 9600.
/Q	Prevents the display of the output to the screen.
/IRQ	Allows changing of the COM port IRQ value from the default setting. The default values are IRQ4 for COM1 and COM3; IRQ3 for COM2 and COM4.

When transferring files over the console, TRANSFER uses DOS calls, by default, to allow operation with CTTY. On some smaller systems it may be preferable to use a BIOS console interface to achieve higher throughput. The /BC option tells TRANSFER to use the BIOS' console interface rather than that of DOS.

TRANSFER Program Examples

The following example receives a file via the console. The data of the file is placed on drive B: in a file named FILE.DAT.

```
A:>transfer /r B:file.dat
```

This example sends the file JUNK.ABC over COM4 at 1200 baud, using IRQ 11.

```
A:>transfer /s /B1200 /COM4 /IRQ11 junk.abc
```

The following two examples show the use of TRANSFER on both the host PC and the target system. The file ED.EXE is sent from the host PC to the target system. The file received on the target system is named VI.EXE.

Target system command:

```
A:>TRANSFER /r  B:VI.EXE
```

Host PC system command:

```
A:>TRANSFER /s C:\BIN\ED.EXE
```

TREE

The TREE command displays each subdirectory and, optionally, the files within them for a specified drive.

Syntax

TREE [*drive*:][*path*] [/F] [/A] [/[]

Remarks

The TREE command displays the full path of each subdirectory on a specified disk.

drive: specifies the drive that TREE displays the subdirectories from. This argument must be specified. The *path* argument can refer to any currently existing subdirectory name.

Option

The /F option causes TREE to display the files in each subdirectory.

The /A option will force the use of text characters instead of ASCII graphical characters.

The /[option hides the program signon message

Examples

```
TREE C:
```

Displays all subdirectories on drive C:.

```
TREE A: /F
```

Displays all subdirectories on drive A: along with the files within each subdirectory.

UMBLINK

UMBLINK builds upper memory blocks (UMBs) which have a distinct MCB chain and may or may not be linked into the DOS MCB chain. UMBLINK can be used on some systems where EMM386 can not be used.

Syntax

DEVICE=UMBLINK.EXE [*x=mmmm-nnnn]*

Remarks

UMBLINK allows for the conversion of various RAM memory regions into DOS UMBs into which device drivers and TSRs may be loaded. UMBLINK is a simple device driver that, once installed, does nothing but filter the Int21h, Function 5803h calls to link and unlink the UMB arena from the normal DOS MCB chain. UMBLINK must appear before any DEVICEHIGH lines in your CONFIG.SYS File.

Unlike EMM386.EXE, UMBLINK.EXE is not a protected mode control program. It finds certain kinds of memory that already exists in the adapter space and links that memory into the DOS upper memory chain. It then becomes resident and, like Datalight's EMM386, becomes the UMB LINK handler for ROM-DOS. The memory types that UMBLINK can recognize are S-ICE.EXE UMBs (eliminating the need for Numega's UMB.SYS), XMS UMBs, and pre-existing RAM that is already either physically or logically addressable within the adapter space at the time the program is run.

Options

The x=mmmm-nnnn argument specified a hex segment range of existing RAM to be excluded from the UMB conversion process. Both mmmm and nnnn must be in the range C000:0h to F000:0h.

Examples

```
DEVICE=UMBLINK.EXE X=C000 - C800
```

Load UMBLINK.EXE and exclude the range from C000:0h to C800:0h from the UMB creation process.

VDISK

VDISK is a device driver that allows you to use RAM as a disk.

Syntax

device = VDISK [*size* [*secs*[*dirs*]]] [/E]

Remarks

VDISK partitions some of your computer's memory as a disk. This disk is called a RAM disk or virtual disk and is much faster than either a floppy or hard disk. The RAM disk can use either standard DOS program memory or extended memory (above 1MB) for the disk. Any data on the VDISK is lost when the system power is turned off.

The *size* argument specifies the size of the VDISK in kilobytes. The default is 64KB. The memory selected is allocated from the DOS memory pool, decreasing the amount of memory available for programs unless the extended memory switch is used.

The *secs* argument specifies the sector size in bytes. The default is 512 bytes per sector. This value must be 128, 256, 512, or 1024. All other values are not valid, and the default of 512 bytes is used.

The *dirs* argument specifies the number of root directory entries. The default value is 64 directory entries. There may be any number of root directory entries between 2 and 1024. If an odd number is given, it is rounded up to the nearest multiple of 16 to fill the entire sector.

The /E argument causes VDISK to use extended memory (memory above the 1MB boundary) instead of DOS program memory for the disk.

The VDISK driver increases the resident size of DOS.

Note: Interrupts are turned off during the transfer of data from extended memory to conventional memory.

Examples

```
device = VDISK.SYS
```

Builds a 64KB RAM disk in DOS memory.

```
device = C:\DOS\VDISK.SYS 220 /E
```

Builds a 220KB RAM disk in extended memory. The VDISK device driver is loaded from the C: drive and the \DOS directory. VDISK assumes the default 512 byte sector size and 64 directory entries.

```
device = VDISK.SYS 45 128 18
```

Builds a 45KB RAM disk in DOS memory. There are 128 byte sectors and 18 root directory entries.

XCOPY

The XCOPY command copies multiple files and, optionally, subdirectories from one disk to another.

Syntax

XCOPY *source* [*destination*] [/A | /M] [/D[:*date*]] [/P] [/S [/E] [/Q] [/F] [/K] [/H] [/W] [/Y | /-Y]

Remarks

Use the XCOPY command to copy multiple files and subdirectories, if they exist.

The *source* and *destination* parameters are complete drive-path and file-specification descriptions. If you do not specify a path, XCOPY assumes the default path. If either filename is not specified, then *.* is assumed.

The ATTRIB command may be used to modify the archive bit for the various XCOPY options that check the archive status of files. Refer to the ATTRIB command on page 83 description for instructions.

Options

The /A option copies only source files that have the archive bit set in them. The archive is not reset.

The /D: *mm-dd-yy* option copies only those files with a date later than that specified.

The /E option creates subdirectories on the target even if they are empty.

The /M option copies only those source files that have the archive bit set. Once the source file is copied, the archive bit is reset.

The /P option prompts before each file is copied. The prompt appears as follows; enter Y to copy the file:

```
C:\COMMAND.COM (Y/N)?
```

The /S option copies files in subdirectories of the source directory.

The /V option verifies each write to the disk.

The /Q option does not display the file names while copying.

The /F option displays full source and destination names while copying.
The /K option copies attributes. Normal xcopy will reset read-only attributes.
The /H option copies hidden and system files also.

The /W option waits before starting to copy files and prompts with the following message.

```
Press any key to begin copying file(s)
```

Example

```
XCOPY \bin\*.exe a: /a
```

Copies all files in the BIN subdirectory to the A: drive that have an .EXE extension and that have the archive bit set.

Mini-Command Interpreter

Some ROM-DOS applications run on standard PCs and require full command interpreter functionality. Some ROM-DOS applications do not require a command interpreter; for instance, when the application is loaded at boot time and runs until the power is turned off.

The mini-command interpreter (MINICMD.COM) suits applications that require a limited and possibly tailored command interpreter. MINICMD.COM contains only the basic functions of COMMAND.COM and is only 4KB as opposed to the 34KB of COMMAND.COM. MINICMD.COM supports program launching, limited batch file execution, echo control, and environment management. MINICMD.COM can also be used to load applications specified in the AUTOEXEC.BAT file at boot time.

/P (permanent) is the only option to MINICMD.COM. The permanent option causes MINICMD.COM to remain loaded at all times and is used by ROM-DOS when initially loading MINICMD.COM. The permanent option causes MINICMD.COM to ignore the EXIT command. The environment size (/E) option is not implemented. The initial environment size can be specified when building ROM-DOS using the *_env_para* variable in the SYSGEN.ASM file.

External Commands

MINICMD.COM executes applications and batch files in the same manner as COMMAND.COM. MINICMD.COM searches in the local directory for the program or batch file and then uses the directories specified in the PATH environment variable. The search precedence is .COM file, .EXE file, then .BAT file.

Internal Commands

MINICMD.COM supports several internal commands. Each internal command can be enabled or disabled by means of a #define statement in the file MINICMD.H. A description of each internal command is given in the following table.

Command	Description	Example
CD	Displays or changes the current working directory.	`CD \database\new` Changes the current working directory to DATABASE\NEW.
COPY	Copies one file to another. This is only a single file copy. Wild cards are not supported. You must provide the full path (if not the current directory) and	`COPY FILE1.DAT \BIN\BACKUP.DAT` Copies one file to the \BIN directory with the new name of BACKUP.DAT.

Command	Description	Example
	filename for both the source and the destination file.	
DEL	Deletes a single file. Wild cards are not supported.	`DEL file1.dat` Deletes the file named FILE1.DAT.
DIR	Displays a list of the files in a specified or the current directory.	`DIR \ROMDOS\DEVSRC` Displays the contents of the \DEVSRC directory.

ECHO [ON | OFF | Text]	The ECHO command followed by text displays the text to the console.
	The ECHO command followed by OFF disables echoing commands and prompts. Commands and prompts will not resume until ECHO ON is entered.
	The ECHO command followed by ON enables echoing of commands and prompts after they were disabled using an ECHO OFF command.
		`ECHO ON`
		Echoes each subsequent command, causing the prompt and command to be displayed.
		`ECHO OFF`
		Disables echoing for each subsequent command, preventing display of prompt and command.
		`ECHO This is an ECHO Example`
		Displays "This is a ECHO Example" regardless of whether ECHO is on or off.

EXIT	Terminates the mini-command interpreter. If the /P option was specified to mini-command interpreter during spawning, then the EXIT command has no effect.	`EXIT`
GOTO	Transfers control to another line in the batch file.	`GOTO MESSAGE` Moves the control of execution within the batch file to the line labeled :MESSAGE.
IF	Allows conditional execution of commands.	Refer to the ROM-DOS User's Guide.
PAUSE	Causes the batch file processing to stop and wait for the user to press a key.	`PAUSE`
REM	Causes the subsequent command-line characters to be ignored; usually used to place comments in a batch file.	`REM This is a comment.`
SET [ARG= [Text]]	Sets, displays, or removes environment variables. SET without arguments displays the current environment variable settings.	`SET Path=f:\bin` Initializes the PATH environment variable to F:\BIN.
TYPE	Displays a text file on the console.	`TYPE File1.dat` Displays the file FILE1.DAT on the

Command	Description	Example
		console.
VER	Displays the version number of MINICMD.COM	`VER`
[DRIVE]	Specifies a new current drive with a single letter followed by a colon.	`A:` Sets the current drive to the A drive.

Configuring the Mini-Command Interpreter

MINICMD.COM is configurable and commands can be added to or removed from it. After modifications, MINICMD.COM must be rebuilt using the Borland C compiler and assembler provided in the Datalight SDTK.

The *command–table* structure contained in CMDMAIN.C lists the internal commands and the associated C-function called when that command is entered on the command line. Removing an entry from the *command–table* structure makes that command unavailable.

A new internal command can be added by adding the command name, along with the name of the C-function into the *command–table* structure. Each new C-function is placed into a separate file so it can be added or removed easily.

The C-prototype for functions implementing a mini-COMMAND is:

```
void do_cmd(char *args);
```

When an internal command is entered, the function in the *command–table* is called with the text options following the command on the command line. For example:

```
C:\>DIR \bin\abc
```

The function to implement the DIR command is called with the *args* option equal to \bin\abc.

Chapter 7, ROM-DOS Server and Client Applications

Serial File Server

With these utilities, the client machine can access some or all of the drives of the server machine through a null modem cable and any serial port. Each of the selected drives on the Server will be mapped to available drive letters on the client machine, in a similar fashion to network drives.

The Serial File Server shares its drives and services the request of the client. The client, or Serial File Link, is able to access and use the remote drives. The serial ports on both systems must be connected via a null modem cable. The Serial File Server utilities work across a standard 3-pin serial cable, similar to other Datalight serial I/O utilities (REMDISK/REMSERV, COMM and TRANSFER). The cable does not require the CTS/RTS DTS/DTR pins.

Server Program

The host or server machine runs the program SERSERV.EXE, which can make any or all of its drives available to the client. The syntax of SERSERV.EXE is

```
SERSERV.EXE [/R] [/N] [/O<list>] [/D<list>] [/C#] [/I#] [/B#] [/W#]
```

Option	Description
/R	Tells the Server not to map removable drives.
/N	Tells the Server not to map network drives.
/O<list>	The program will only map drive letters from this <list>.
/D<list>	The program will not map any drive letters from this <list>.
/C#	Selects the communication port. Available ports are 1 through 4. COM1 is the default port.
/I#	Set the IRQ for the communications port. Valid settings are 3 – 15. Default is IRQ3 for COM2 and COM4, and IRQ4 for COM1 and COM3.
/B#	Selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115000. The default baud rate is 115000.
/W#	Sets the time-out in the range of 2 to 60 seconds. The default is 10 seconds.

To display a help screen for SERSERV from the DOS prompt, enter

```
SERSERV /?
```

Example: To connect to a normal server with COM1 at 115200 baud, and map all drives except for logical drives (which are never mapped), enter

```
SERSERV
```

The server program can be terminated at any time by pressing the Q key. SERLINK can then no longer access any of the servers drives until the SERSERV program is run again.

Note: This option should not be used when the client has files open, since they will be closed when quitting.

Client Program

The program SERLINK runs on the client system and creates new drive letters for the client. SERLINK uses the next available system drive letters, in order. For example, if the last assigned drive was D:, the first drive SERLINK creates is drive E:. This drive acts like any other network drive, except that it requires the serial port. The syntax for loading SERLINK is:

```
SERLINK.EXE [/R] [/N] [/O<list>] [/D<list>] [/C#] [/I#] [/B#] [/W#]
```

The syntax for unloading SERLINK is:

```
SERLINK.EXE /U
```

Option	Description
/U	Unloads SERLINK from memory, thereby disabling the drive letters and freeing the memory occupied by SERLINK
/R	Tells the Server not to map removable drives.
/N	Tells the Server not to map network drives.
/O<list>	The program will only map drive letters from this <list>.
/D<list>	The program will not map any drive letters from this <list>.
/C#	Selects the communication port. Available ports are 1 through 4. COM1 is the default port.
/I#	Set the IRQ for the communications port. Valid settings are 3 – 15. Default is IRQ3 for COM2 and COM4, and IRQ4 for COM1 and COM3.
/B#	Selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115000. The default baud rate is 115000.
/W#	Sets the time-out in the range of 2 to 60 seconds. The default is 10 seconds.

To display a help screen for SERLINK from the DOS prompt, enter

```
SERLINK /?
```

Example: To connect to a normal server with COM1 at 115200 baud, and map all drives except for logical drives (which are never mapped), enter

```
SERLINK
```

Example: To install SERLINK from the DOS prompt or from a batch file (such as AUTOEXEC.BAT) at 9600 baud, on COM2, and not map any removable drives, enter

```
SERLINK /B9600 /C2 /R
```

Remote Disk Program

The remote disk program allows you to access a disk drive on a remote system via a serial cable and standard PC-style (8250UART) serial port. Remote disk allows added flexibility for diskless systems and systems tight on available space.

In a remote disk setup one system, called the server, shares its drives.. The other system, called the client, accesses and uses the remote drives. The serial ports on both systems must be connected via a null modem cable. Remdisk/Remserv works across a standard 3-pin serial cable, similar to other Datalight serial I/O utilities (COMM and TRANSFER). The cable does not require the CTS/RTS DTS/DTR pins.

Server Program

The server system runs the program REMSERV.EXE that can make a single drive on the server system available to the client. The available drive can be changed at any time by quitting the REMSERV program and then running the program again with a new drive letter. The syntax of REMSERV.EXE is

```
REMSERV.EXE d: [/Bnnnn] [+|-] [/COMn] [/Tnnn] [/S] [/H]
```

where d: represents the letter of the drive the server makes available to the client.

Option	Description
/B*nnnn*	Selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115000. The default baud rate is 115000.
+/-	The plus sign (+) specifies packet-style transmission and is recommended for any baud rate over 19200. The default setting is to include + for packet transmission. Use the minus sign (-) to specify polling operation under Windows95.
COM*n*	Selects the communication port. Available ports are 1 and 2. COM1 is the default port.
/IRQ*n*	Set the IRQ for the communications port. Valid settings are 3 – 15. Default is IRQ3 for COM 2 and COM4, and IRQ4 for COM1 and COM3.
/T*nnn*	Sets the time-out in the range of 2 to 3,640 seconds.
/S	Instructs REMSERV to run without any display output.
/H	Selects hardware handshaking for flow control. To select drive B: as the available server drive at 115000 baud, packet transmission, using COM1, enter `REMSERV B:` To set drive C: as the server disk at 9600 baud, without packet-style transmission, on COM2, enter: `REMSERV C: /B9600 /COM2`

The server program can be terminated at any time by pressing the Esc key. The client can then no longer access the server's drive until the REMSERV program is run again.

Client Program

The program REMDISK runs on the client system and creates a new drive letter for the client. REMDISK uses the next available system drive letter. For example, if the last assigned drive was D:, REMDISK creates drive E:. This drive acts like any other drive, except that it requires the

serial port. REMDISK.EXE can be loaded by a DEVICE= command in the CONFIG.SYS file can be entered at the DOS prompt. The syntax for REMDISK is:

```
REMDISK [/U] [/H] [/Bnnnn] [+|-][/Tnnn] [/COMn]
```

Option	Description
/U	Unloads REMDISK from memory, thereby disabling the drive letter and freeing the memory occupied by REMDISK. This option can only be used when REMDISK is installed from the DOS command line. A remote disk installed via CONFIG.SYS cannot be unloaded.
/H	Selects hardware handshaking for flow control.
/B*nnnn*	Selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115000. The default baud rate is 115000.
+/-	The plus sign (+) specifies packet-style transmission and is recommended for any baud rate over 19200. The default setting is to include + for packet transmission. Use the minus sign (-) to specify polling operation under Windows95.
/T*nnn*	Sets the time-out in the range of 2 to 3,640 seconds.
/IRQ*n*	Set the IRQ for the communications port. Valid settings are 3 – 15. Default is IRQ3 for COM 2 and COM4, and IRQ4 for COM1 and COM3.
COM*n*	Selects the communication port. Available ports are 1 and 2. COM1 is the default port.

To install the REMDISK program from CONFIG.SYS at 19200 baud, on COM1, using packet-style transmission, insert the following line in CONFIG.SYS and then reboot the system (remember to include the full path to find REMDISK.EXE if not located in the root directory).

```
DEVICE=REMDISK.EXE /B19200 +
```

To display a help screen for REMDISK from the DOS prompt, enter

```
REMDISK /?
```

To install REMDISK from the DOS prompt or from a batch file (such as AUTOEXEC.BAT) at 9600 baud, without packet-style transmission, on COM2, enter

```
REMDISK /B9600 /COM2
```

To unload the REMDISK installed from the batch file or the DOS prompt, enter

```
REMDISK /U
```

Using the Remote Disk

To use the remote disk, both REMDISK and REMSERV must be running on their respective systems and must use the same baud rate and packet or nonpacket style transmission. After starting both programs, you can access the new drive on the client system. You can change the default directory to this new drive, copy files to and from the remote drive, and also run utilities such as CHKDSK on the drive. The remote drive on the server system can be used as any other drive on the client system.

Unloading the Server Remotely

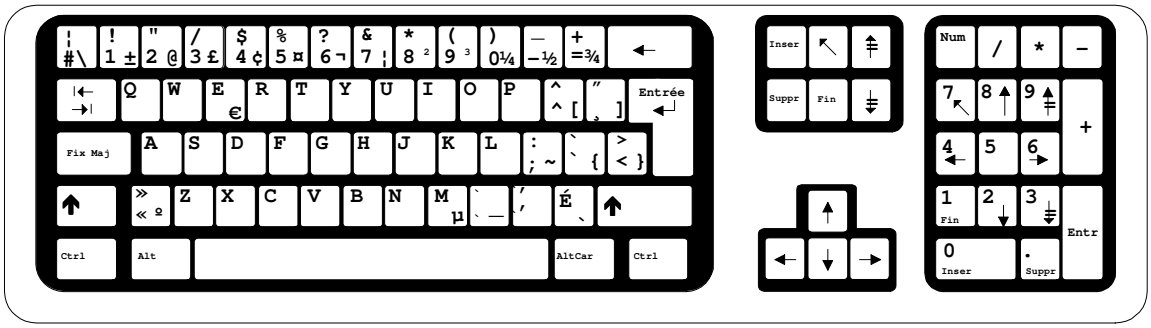
To unload the remote server, REMSERV, use the utility REMQUIT on the client, REMDISK. REMQUIT takes no command line parameters.

Chapter 8, ROM-DOS Keyboard Layouts

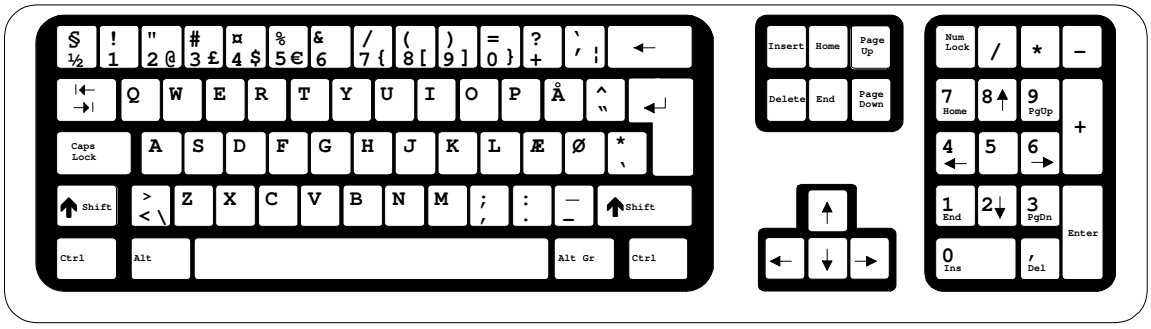
Keyboard Layouts

The following keyboard charts represent several countries supported by ROM-DOS. If you need a keyboard layout not displayed in this Appendix, please contact Datalight.

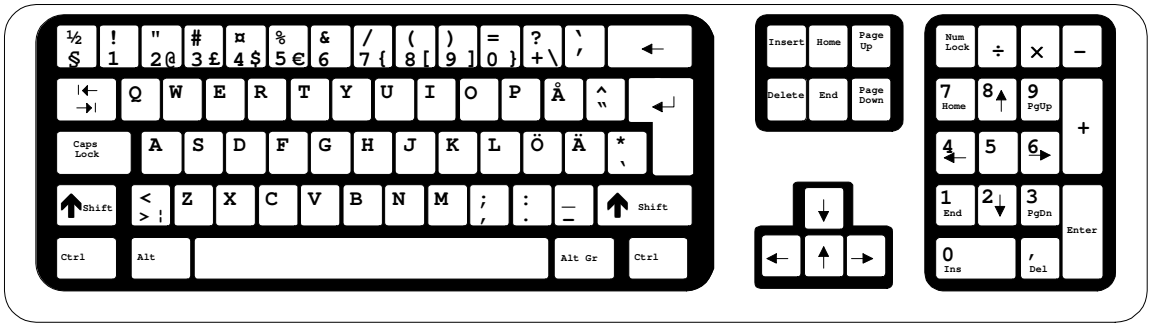
Canada



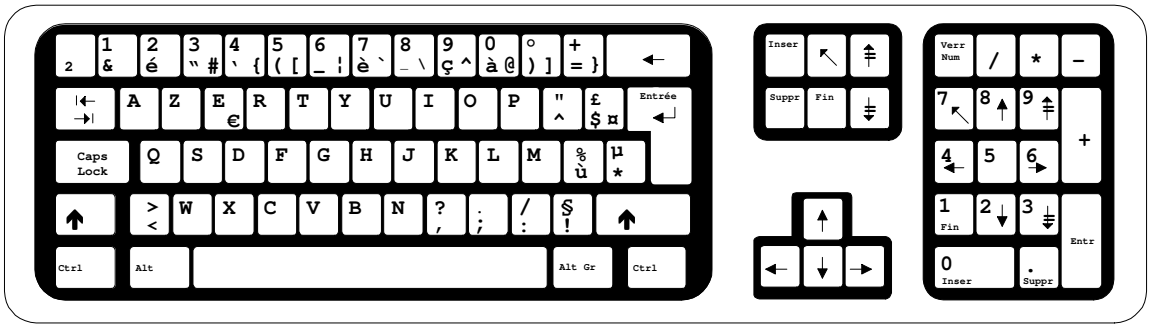
Denmark



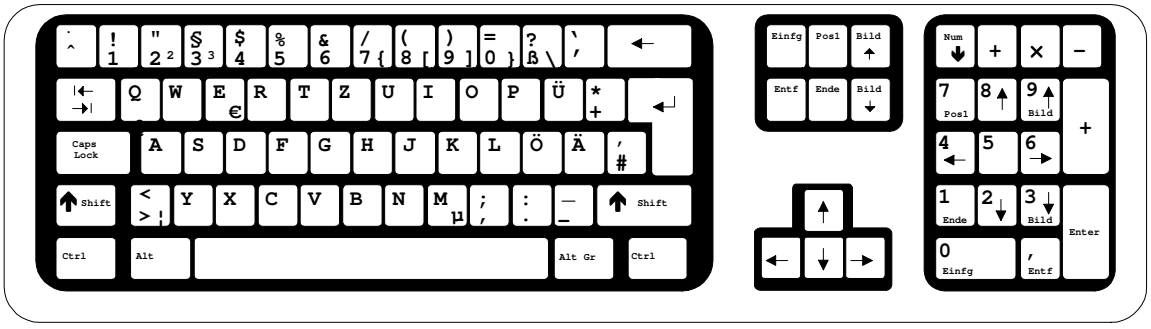
Finland



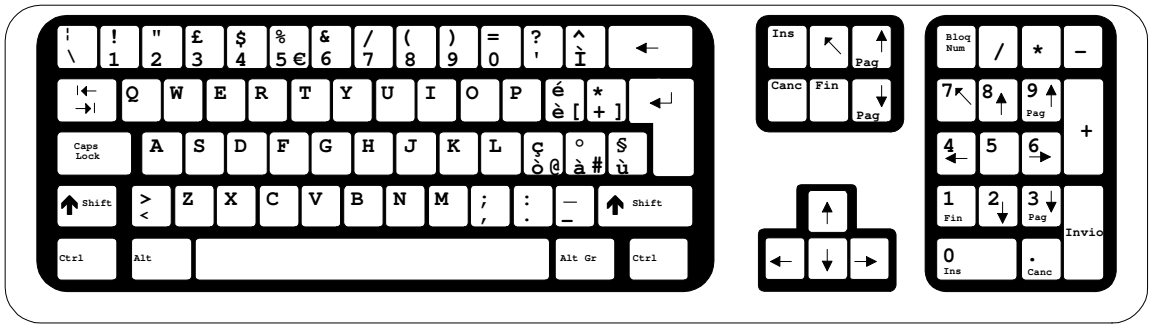
France



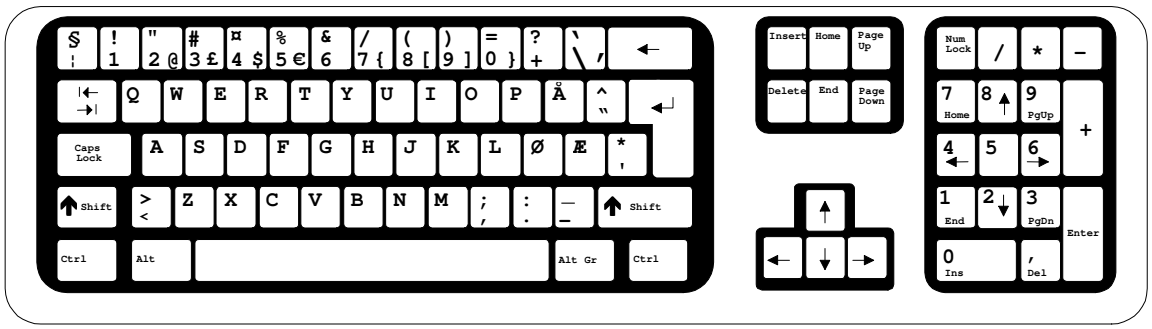
Germany



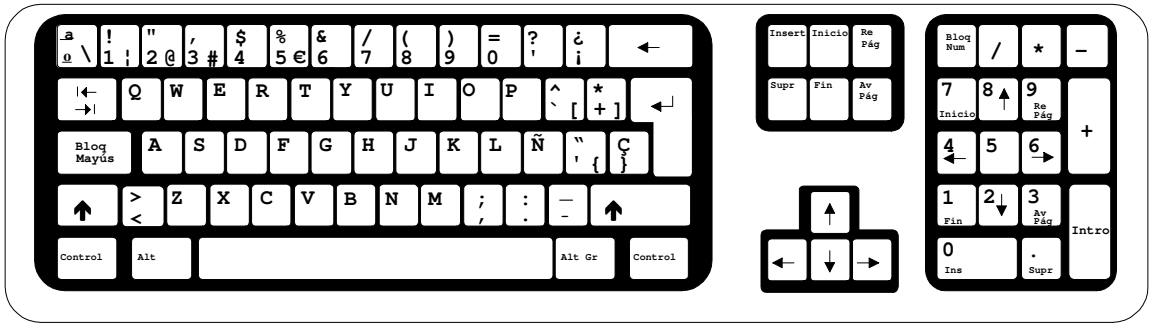
Italy



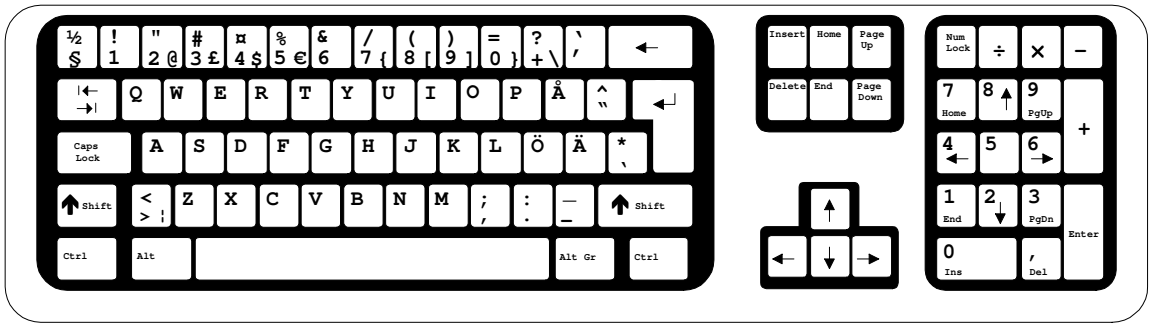
Norway



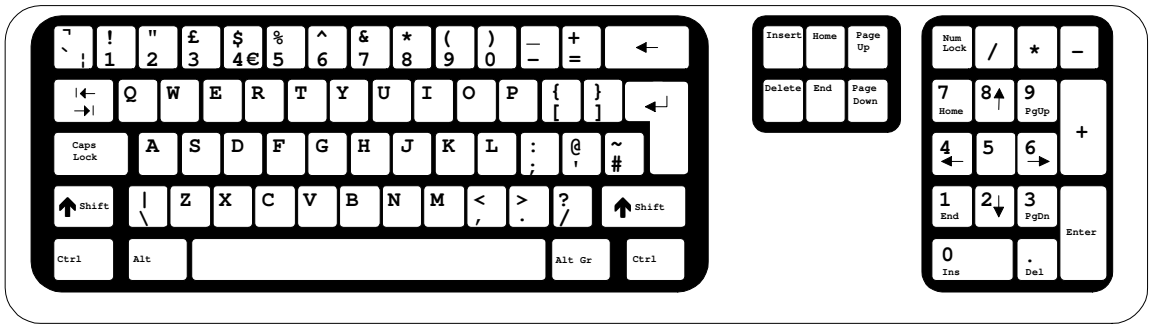
Spain



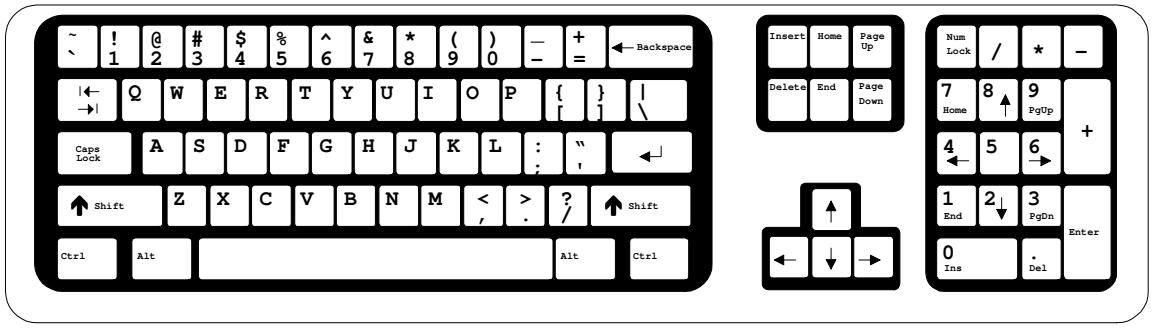
Sweden



United Kingdom



United States



ROM-DOS Glossary

ANSI (American National Standards Institute)

A group that defines U.S. standards for the information processing industry. ANSI participates in defining network protocol standards.

API (Application Program Interface)

An API is a specification of the methods an application programmer can use to access services provided by a software module. In the case of a network, the API specifies the interface to the network software. A common way of interfacing a terminal emulator to networking software in a PC is to use Interrupt 14h. This is the PC BIOS entry point for serial port support, but when used for networking purposes, the original entry point is reused to provide a similar, but much expanded function. In addition to the native character at a time transfer, block transfers are also offered to increase throughput.

Baud

Literally, the number of times per second the signal can change on a transmission line. Commonly, the transmission line uses only two signal states making the baud rate equal to the number of bits per second that can be transferred. The underlying transmission technique may use some of the bandwidth, so it may not be the case that users experience data transfers at the line's specified bit rate.

BIOS

Basic Input Output System – software that interfaces directly with the hardware.

BIOS extension

A short program that the BIOS recognizes and executes as the BIOS initializes the system.

Boot

Booting is restarting and reloading DOS. A PC can be booted by turning it off and then turning it on or by pressing the Ctrl, Alt, and Del keys simultaneously.

Bootable disk

A system disk that contains the files necessary to start and run the computer.

BOOTP (Bootstrap Protocol)

A protocol a host uses to obtain startup information, including its IP address, from a server.

Built-in device

Built-in device is an input/output device which is part of the DOS kernel.

DOS

Disk Operating System – an operating system that relies on disks for file storage.

DOS kernel

The DOS kernel is the part of DOS that handles a standard DOS call (Int 21h). It handles opening, reading/writing of files, loads programs, and manages memory.

FAT

File Allocation Table – a data table which allows DOS to keep track of file location on the disk so that they can be accessed by programs running on DOS.

Flow control

Control of the rate at which hosts or routers inject packets into a network or Internet, usually to avoid congestion.

LAN (Local Area Network)

Any physical network technology designed to span short distances (up to a few thousand meters). Usually, LANs operate at tens of megabits per second through several gigabits per second.

Memory disk

A disk that uses either ROM or RAM for the disk media. The memory disk has a FAT, directories, and file data.

MTU (maximum transmission unit)

The largest amount of data that can be transferred across a given physical network.

PCMCIA

Personal Computer Memory Card Interface Association. PCMCIA is a group that defined the standard for a credit-card size card that may act as a memory RAMDISK, ROMDISK, or FLASHDISK. These cards are commonly referred to as PC cards.

POST

Power On Self Test – a test performed by the BIOS that checks the computer hardware for problems before fully initializing the computer.

RAM disk

A disk drive that uses RAM for the media in place of the usual rotating disk drive.

ROM-DOS

Datalight operating system that can be placed in and execute from within a ROM.

ROM disk

A disk drive that uses ROM for the media in place of the usual rotating disk drive.

ROM scan

The scanning of the ROM area for BIOS extensions performed by the BIOS at initialization time.

ROM

Read Only Memory. This is memory that is not changeable once placed in a computer.

Shell

The Shell is the command interpreter, usually COMMAND.COM. The shell takes text commands and calls the DOS kernel to implement them.

System disk

See Bootable disk.

Chapter 9, SOCKETS Introduction

About SOCKETS

System Requirements

SOCKETS requires an IBM compatible 186 or higher system with a minimum:

- 512KB of RAM
- ROM-DOS 6.22 or compatible

SOCKETS network operation requires one or more of the following, depending on the network configuration:

- Any network interface supporting the packet driver specification class 1, 3, 6 or 11.
- PC compatible asyncronous serial ports (COM ports).
- Any network interface supporting the ODI specification

Datalight SOCKETS is an Internet protocol software extension to ROM-DOS that provides a powerful data communication facility whereby embedded systems and users of embedded systems can communicate with other computers (including PCs and mainframes) and their printers. Datalight SOCKETS also provides the facilities to run custom-written applications which allows you to:

- Run applications on a TCP/IP host system from a remote embedded system.
- Transfer data between an embedded system and TCP/IP hosts.
- Run network aware applications on an embedded system.
- Print to an embedded system from TCP/IP hosts and vice versa.

Datalight SOCKETS consists of :

- A TSR kernel:

  Connecting to a physical Ethernet or Token Ring network using a network interface with associated Packet Driver and/or to a point-to-point serial network using standard serial communication ports with or without modem dial in/out.

  Implementing standard Internet protocols ARP, PPP, LCP, IPCP, IPv6CP, PAP, CHAP MD5, IP, IPv6, ICMP, ICMPv6, IGMP, RIP, UDP, TCP, BOOTP, DHCP and DNS.

  Providing IP routing support for IPv4.

  Providing two Application Programming Interfaces (APIs)

  Providing a Socket Print client

  Providing a Socket Print Server and LPD Server

  Optionally keeping MIB II status and statistical information.
- C libraries and source code to access the APIs including a TCP/IP Sockets library implementing the BSD Sockets abstraction. The libraries also support 32 bit applications using a DOS extender.

- A Sockets kernel build program.
- A SOCKETS configuration program.
- Utility programs to test the network and display the status of the kernel.
- Mail programs in source and binary format.
- Resident servers for FTP, HTTP and Remote Console including a CGI API for serving dynamic web-pages and a Remote Console Java applet to emulate a DOS console of the embedded system on a Java capable browser. Remote Console clients for both DOS and Windows. WebDos, a methodology to enable browser based access to an embedded system, including WebForms for easy browser accessed application development and WebDos Commander for managing the embedded file system.
- An FTP client and DOS and Windows versions of HTTP file GET and PUT utilities.
- Print clients for SOCKETS printing and LPD printing (LPR).
- A resident FTP API to implement FTP client/server functionality in user written programs.
- A resident RFC compliant NETBIOS API allowing file sharing using third party and freeware redirectors and file services.

Chapter 10, SOCKETS Installation

Installing and Running SOCKETS

Upon receiving SOCKETS, electronic or CD, SDK or demo, the first step involved is installing to a Windows 9X or WIN NT based development system. The install process will create, by default, a directory of C:\DL\SOCKETS.

```
<root>
   '
   +---<DL>
         ¦
         +--- SOCKETS
                +--- BSDSOCK
                +--- BUILDLIB
                +--- CAPI
                +--- CLIENTS
                +--- CONFIGS
                +--- EXAMPLES
                +--- INCLUDE
                +--- LIB
                +--- SERVER
                +--- UTILS
```

Default Directory Structure

The files installed cover:

- Kernel applications (the core of TCP/IP communication)
- Configuration examples
- Utilities
- Optional applications
- API with programming examples

The SDK does not include drivers for Network Interface controllers; hereafter referred to as a NIC. Please refer to Chapter 3 for information on obtaining and configuring network drivers as well as serial configuration details.

The remainder of this chapter describes how to proceed after SOCKETS has been installed to the development system.

Development System Procedure

Insert the ROM-DOS / SOCKETS SDK into your CD-ROM and run "D:\SETUP" where "d" is the appropriate drive letter for your CD. The install process will create a DL\SOCKETS directory. Within the directory DL\SOCKETS will exist the pre-built kernel applications SOCKETM.EXE and SOCKETP.EXE and the Sockets custom kernel build utility, SBUILD. Beyond that, there are subdirectories for:

- UTILS - contains tools for troubleshooting and configuring SOCKETS.

- CONFIGS - contains example configuration files for SOCKETS connections.
- EXAMPLES - contains programming examples.
- CAPI - contains the source code of the Basic API, CAPI.
- BSDSOCK - contains the source code of the Advanced Sockets API.
- CLIENTS - contains the client applications.
- SERVER - contains the SOCKETS server providing HTTP and FTP services.
- INCLUDE - contains the header files to compile user programs and custom kernels.
- LIB - contains the libraries of the APIs to link user programs.
- BUILDLIB - contains the kernel libraries to build custom kernels.

Environment Variables

SOCKETS uses environment variables to determine the location of necessary configuration files. They can be set, using the DOS *SET* command, within the autoexec.bat file at startup or within a batch file prior to SOCKETS being loaded. They are:

- SOCKETS
- HTTP_DIR
- HOSTNAME
- FTPDIR

Examples

Set SOCKETS=C:\NETWORK

Set HTTP_DIR=C:\HTML

Set HOSTNAME=FTPDEMO

Set FTPDIR=C:\FTP

Remarks

The environment variable *SOCKETS* is used to indicate to the SOCKETS kernel where configuration files, license file for the demo version, and access rights files are located. For example "Set SOCKETS=C:\NETWORK" would cause SOCKETS to look for configuration files within the directory of C:\NETWORK.

The environment variable *HTTP_DIR* is used by the SOCKETS server and indicates the location of html files if the files are stored in a separate directory from the server executable. To continue with the previous example if the server were in the directory of C:\NETWORK and the html files were in C:\HTML then the environment variable would read "SET HTTP_DIR=C:\HTML".

The environment variable *HOSTNAME* is used by SOCKETS to indicate the banner name displayed during an FTP session.

The environment variable *FTPDIR* is used by SOCKETS to indicate the location of the temporary file created by the SOCKETS server during an FTP session. Please refer to Chapter 7 for more details.

File Selection

What you wish to do with the SOCKETS TCP stack will dictate which files are to be transferred to the target hardware. At a minimum your target hardware will require the TCP stack executable:

- SOCKETM.EXE for serial / ppp connection
- SOCKETP.EXE for an Ethernet connection
- SOCKET.CFG for both serial and ethernet use
- MODEM.MCF for a serial / ppp connection

If you wish to use the Datalight Web Server with SOCKETS you will need the HTTPD.EXE, HTTPFTPD.EXE or SUPERD.EXE file located within DL\SOCKETS\ \SERVER. You will also need an index.htm file that contains the home page of the web server . One has been provided within the same directory.

Full explanations of the files are available in"*Chapter 7, ROM-DOS Server***"on page 137.***

Building a custom SOCKETS kernel

Building a kernel containing only the features required by the application is performed using the SBUILD utility. This process is described in detail in the Tutorials chapter of the Developer's Guide.

Configuration

The configuration of SOCKETS is determined by what you would like to do with the TCP/IP stack. Some examples are provided within "**Chapter 13, SOCKETS Configuration Examples**" of the types of configurations easily accomplished with SOCKETS. For quick testing of SOCKETS please reference the sample configuration files supplied within the **\CONFIGS** directory. Their explanations are found in "**Chapter 13, SOCKETS Configuration Examples**".

To make your own configuration, run the supplied file sconfig.exe to configure SOCKETS for your target hardware. SCONFIG.EXE is a text-based tool that will prompt for various settings necessary to customize SOCKETS. At completion sconfig.exe creates the file SOCKET.CFG that must accompany SOCKETS to the target hardware. Running SCONFIG may take place on either your target hardware or your development system. If you wish to configure the stack after transferring files to your target hardware, please include the file SCONFIG.EXE in your list of files to be transferred to your target hardware.

Transfer

Transfer the selected files onto the target system into a \DL\SOCKETS\ directory. As Datalight ROM-DOS has various methods of serial port transfers available, please refer to the ROM-DOS manual for specific details.

Testing

If you are using an Ethernet TCP stack you must first load a packet driver specific to your NIC. The packet driver provides a software interrupt to allow communication between the NIC and SOCKETS (default is 0x60). If you do not have a packet driver or are unsure of its use please

contact Datalight Technical Support. Although Datalight does not manufacture packet drivers our support team is knowledgeable about packet driver implementation.

Type SOCKETM.EXE or SOCKETP.EXE to launch SOCKETS. The various options for launching SOCKETS are:

/n=normal_sockets

/i=capi_interrupt

/d=dos_compatible_sockets

/m=memory_size

/p=print_delay

/s=stack_size

/v=interrupt_vector

/q

/0

/u

Once SOCKETS has been loaded correctly, the most basic test to ensure that everything is working correctly is to "PING" a known server or gateway that the SOCKETS machine is connected to. If the ping is returned everything is working, if the ping fails please refer to the troubleshooting section of the SOCKETS manual.

Custom Applications

The key to designing an application to work with SOCKETS is the TCP/IP Basic and Advanced APIs. These APIs provide the interface between your application and SOCKETS. The TCP/IP Basic and Advanced APIs must be linked into your application at compile time. At the time of this manual both APIs have been designed to work with the Borland C, Microsoft C 1.52 and GNU-C, DJGPP compilers. The latter compiles 32 bit code for DOS and can be used with a DPMI DOS extender. Other ports of the TCP/IP Basic and Advanced APIs will be posted upon completion. The SOCKETS manual details each of the functions within the APIs and can be used as a reference if you need to make changes in order to compile either API into your application. Please contact your sales rep or technical support for an updated compiler compatibility list.

Chapter 11, SOCKETS Configuration

Configuring SOCKETS consists of setting up environment variables, loading required drivers, creating configuration files and running the appropriate SOCKETS kernel with the correct command line parameters.

The SOCKETS environment variables are discussed in **Chapter 10, SOCKETS Installation**.

Packet Driver

When SOCKETS is required to interface to a Local Area Network or any special network, one or more Packet Drivers must first be loaded. A Packet Driver presents a standard interface to underlying network hardware and is normally supplied by the vendor of the NIC used to connect to the physical network.

The following packet-driver classes are supported:

- Class 1 DIX Ethernet
- Class 3 Token Ring
- Class 6 SLIP
- Class 11 IEEE Ethernet

Most Ethernet packet drivers support both classes 1 and 11. As the default, Class 1 should normally be used.

Each Packet Driver requires a software interrupt vector through which it is accessed. For a single Packet Driver, Interrupt 0x60 or 0x69 is normally used. Avoid using Interrupt 0x61 and 0x7f as those are the defaults used by the SOCKETS APIs. Interupt 0x62 is the default used by the SOCKETS FTP API and 0x63 that of the SOCKETS HTTP Extension CGI API.

For specific information on loading packet drivers, refer to the documentation of the specific driver you are using.

Example:

```
rtspkt 0x60
```

When only one Packet Driver is used, the SOCKETS kernel will search for the interrupt vector when the interface command in the configuration file specifies that a Packet Driver must be used. The interrupt can also be explicitly specified and must be so specified when more than one Packet Driver are used.

Serial Operation

Hardware considerations

For asyncronous serial operation SOCKETS supports the standard PC COM ports without an external driver. Up to six COM ports with or without interrupt sharing may be used. SOCKETS

checks for and uses FIFO buffered 16550 UARTs for faster throughput. It is strongly recommended that buffered UARTs be used for high-speed applications.

The interface command in the configuration file specifies the I/O address, hardware interrupt and speed to be used and parameter commands can be used to specify character data format and flow control. Flow control may be performed by means of modem control signals (hardware flow control) or XON/XOFF control characters (software flow control). Software flow control is only possible when PPP is used. It will not function for SLIP or CSLIP.

PPP Funtionality

PPP can be set up for "client" and/or "server" operation. "Client" operation normally refers to a dial-out operation and "server" to a dial-in operation.

For "server" operation, log-in is controlled by a list of Username/Password pairs, each coupled to a remote IP address, which is assigned to the peer if requested to do so during the IPCP negotiation. As an option, a Username/Password pair can be flagged to provide Callback Verification (CBV). In this case, the call is terminated as soon as the PPP negotiations have been successfully completed. Then a reverse call is made by the server; using the number in the modem command file if a modem is involved. During the first subsequent set of PPP negotiations, the CBV flag is ignored to prevent another callback. When the PPP session terminates, the CBV flag is again enabled.

Another PPP feature is the ability to specify that a PPP session should start immediately when SOCKETM is loaded, or to delay that until traffic is generated. It is also possible to specify two sets of PPP parameters per interface. One set of parameters is for outgoing connections; the other set is for incoming connections.

Modem Operation

When using serial operations, modem dial-in and dial-out, may optionally be used. Simple modem scripting commands contained in modem configuration files may be used to establish modem connections. Commands in the modem file can specify that a dial-up connection will always be dialed whenever DCD is not detected, or specify that dial on demand is disabled. For robust operation, it is recommended that the DCD modem signal be supported by the hardware and that the modem must drop a connection when the DTR modem signal is lowered.In order to work properly, the modem must support a command set like the AT command set. If the hardware does not comply to this requirement, a modem may still be used. In this case the interface will be specified as not having a modem and a user program must perform the modem connect/disconnect functions. An API function, **IfaceIOCTL()**, is provided to make this possible. **IfaceIOCTL()** allows a user program to:

- Initiate a modem connection (dial)
- Disconnect a modem connection
- Enable or disable dial on demand
- Enable or disable a serial port to allow a user program to access it without conflict
- Read modem and connection status.

A sample program, IOCTL.EXE, shows the use of this function and is provided in source and binary format in the SOCKETS Software Development Kit.

SOCKETS Configuration Files: SOCKET.CFG, HOSTS

SOCKETS uses two files in the \DL\SOCKETS directory (default), or any other directory specified by the SOCKETS environment variable. These files are SOCKET.CFG, the default start-up file, and HOSTS, the host names file. If not found, SOCKETS uses the default SOCKET.CFG in the \DL\SOCKETS directory. For a single interface LAN configuration a configuration file need not exist. If not found, SOCKETS will default to an interface called if0 with DHCP support for IPv4 and address autoconfiguration for IPv6.

SOCKET.CFG is a text file containing configuration commands. Empty lines and lines starting with # are ignored. Commands are used to specify protocol parameters like the IP address of the stack, interface parameters like Packet Driver or Asyncronous Serial lines, routes and various other parameters. Here is a simple example:

```
ip address demo
   Set the IP address of this host to 192.6.1.1.
interface pdr if0 dix 1500 5
   Use Packet Driver, naming the interface 'if0', MTU=1500, Receive
   buffers = 5
route add default if0 router
   Route all traffic to unkown destinations via 'if0' using 'router'
   as a gateway
tcp mss 1460
   TCP Maximum Segment Size = 1460.
tcp window 2920
   TCP Maximum window = 2920.
start prntserv
   Start printer server on PRN using default port of 10.
```

HOSTS is an optional file containing mappings of IP addresses in dotted decimal notation to names.

Sample HOSTS file:

```
192.6.1.1     demo
192.6.1.2     router
192.6.1.3     server
```

Configuring for IPv6 operation

Since IPv6 is autoconfiguring, no new configuration commands are used. In an IPv6 only kernel the 'ip address *host*' command is ignored except that *host* is stored as the local host name which only has local significance. A link-local address is automatically configured using the MAC address as a basis. Other addresses are auto-configured from the MAC address and prefixes advertised by routers.

The 'route' command is not implemented for an IPv6 only kernel. Default router lists are configured from Route Advertisements sent by routers.SCONFIG Overview

SCONFIG is a SOCKETS configuration utility. It supports only the barest configurations: Ethernet over a packet driver and PPP over a serial modem. Just answer the multiple choice questions, and then fill in a few data fields and **SCONFIG** writes simple *SOCKET.CFG* and *MODEM.MCF* files for you.

SOCKET.CFG Samples

The following configuration file contains the minimum possible commands for a valid configuration file: just one. This is to specify that the interface should use a Packet Driver, the interrupt vector which must be searched for. It should use DIX encapsulation, have an MTU of 1500 and have a maximum of 5 receive buffers. Since no IP address is specified, BOOTP will be used and the required operating parameters will be retrieved from a BOOTP server, which must be available on the network. For an IPv6 only kernel, this single line file is also sufficient.

SOCKET.CFG:

```
interface pdr if0 dix 1500 5
```

The following is a more typical example specifying a static IP address, a Packet Driver interface, a default route, the TCP MSS and WINDOW, and the SOCKET PRINT server to be started.

SOCKET.CFG:

```
# Sample configuration file
ip address 192.6.1.1
interface pdr if0 dix 1500 5
route add default if0 192.6.1.2
tcp mss 1460
tcp window 2920
start prntserv
```

The next example is a configuration file for running PPP over a direct serial link (no modem). It uses COM1 at the default I/O address of 0x3f8 using interrupt level 4 at 9600 baud with no flow control. The local IP address in this case will be obtained from the PPP peer. No compression of PPP headers and no TCP/IP header compression will be negotiated. No authentication will be done.

SOCKET.CFG:

```
iface asy p0 ppp 1500 30 0x3f8 4 9600
route add default p0
par p0 ipcp local address 0.0.0.0
par p0 lcp start
par p0 ipcp open
```

The following example is a a more typical configuration file for running PPP over a direct serial link with a modem. It uses COM1 at the default I/O address of 0x3f8 using interrupt level 4 at

28800 baud with Xon/Xoff flow control. The local IP address in this case will be obtained from the PPP peer. Compression of PPP headers and TCP/IP header compression will be negotiated. PAP authentication will be negotiated and "PppUser" as a username and "PppPasword" as a password will be used for authentication. Modem commands will be retrieved from the MODEM.MCF file.

SOCKET.CFG:

```
iface asy p0 ppp 1500 30 0x3f8 4 28800 modem.mcf
param p0 288000 x x
route add default p0
par p0 lcp local accm 0x0a00000
par p0 lcp local acfc on
par p0 lcp local pfc on
par p0 lcp local magic on
par p0 pap user PppUser PppPassword
par p0 ipcp local compress tcp 16 1
par p0 ipcp local address 0.0.0.0
par p0 lcp start
par p0 ipcp open
```

SOCKETP, SOCKETM and SOCKETS Overview

Two pre-built versions of the SOCKETS kernel are available: SOCKETM.EXE provides support for serial connections as well as Packet Driver connections. SOCKETP.EXE only provides support for Packet Drivers and has a smaller memory footprint than SOCKETM.EXE. A Sockets kernel may also be custom-built using the SBUILD utility. By default this kernel is named SOCKETS. SOCKETS, SOCKETM or SOCKETP runs as a Terminate and Stay Resident (TSR) program.

Running SOCKETS without any parameters will be sufficient in simple configurations and will use the default %SOCKETS%\SOCKET.CFG and %SOCKETS%\HOSTS configuration files. Parameters are used to specify another configuration file and to tailor the facilities like memory and stack usage, number of simultaneous connections and the API interrupt vectors to use. The /U parameter may be used to unload an already resident SOCKETS kernel.

PING

The **PING.EXE** program gives a quick method to test your SOCKETS installation. The source code is also supplied as an example.

Syntax

PING *IP_address*

Where the *IP_address* may be a numeric or symbolic address. Refer to the Sockets Utilities description for advanced PING options that can be specified.

SOCKETS COMMAND SUMMARY

Command	Description	Location
ARPSTAT	Displays information about the current ARP table and allows entries to be removed.	Page 217
CAPIDIAG	A diagnostic program for the SOCKETS TCP/IP Basic API, the stack and the network.	Page 217
DHCPSTAT	Displays status about the DHCP settings and allows a DHCP lease to be renewed.	Page 218
FTP	File Transfer Protocol (FTP) client application.	Page 219
FTPD	A server providing FTP services.	Page 252
FTPAPI	A TSR that provides FTP services through an application programming interface.	Page 222
GETMAIL	A POP3 mail client.	Page 223
HTTPD	A server providing HTTP services.	Page 245
HTTPFTPD	A server providing both HTTP and FTP services.	Page 255
HTTPGET	An application that can retrieve files from an HTTP server.	Page 223
HTTPPUT	An application that can put files to an HTTP server.	
IFSTAT	Displays information about configured SOCKETS interfaces.	Page 224
IOCTL	A diagnostic utility for testing the SOCKETS TCP/IP Basic API IOCTL functions.	Page 226
IOCTLH	A diagnostic utility for testing the SOCKETS TCP/IP Basic API IOCTL Hotswap functions for wireless or removable Ethernet cards.	Page 227
IPSTAT	Displays information about SOCKETS memory usage and IP interface.	Page 227
LPR	A printer client for UNIX style print servers.	Page 228
MAKEMAIL	Prepares text and data for sending through **SENDMAIL**.	Page 229
MEMSTAT	A utility that reports memory usage statistics.	
NETBIOS	A TSR that provides a NETBIOS compatible network interface.	Page 231
PDTEST	A diagnostic program that tests loaded packet drivers.	Page 233
PING	A utility to send ICMP echo requests and report on replies.	
RC.JAR	A Java remote console applet for connecting to hosts running **HTTPD.**	Page 233
RC_DK.JAR	A version of RC.JAR with Danish keyboard support.	Page 235
RCCLI	A DOS remote console client for connecting to hosts running	Page 235

Command	Description	Location
	HTTPD.	
ROUTE	A utility to display and manage routes.	
SCONFIG	A SOCKETS configuration utility.	Page 158
SENDMAIL	delivers e-mail messages packaged by **MAKEMAIL** to an Internet mail server.	Page 236
SETHOST	Sets an environment variable to the name of the SOCKETS client based upon the client's MAC address.	Page 237
SNTPCLI	Used for getting the system network time information.	Page 237
SOCKDIAG	A utility used to diagnose the SOCKETS TCP/IP Advanced interface, the stack and the network.	Page 240
SOCKSTAT	A utility to report the status of TCP and UDP sockets.	
TCP	a utility used to examine and change the TCP parameters.	Page 241
XPING	A utility to send ICMP messages continuously to a specified host and report on replies.	Page 243

Chapter 12, SOCKETS Configuration Commands

Commands

Overview

This section describes the SOCKETS configuration commands available when starting and running SOCKETS. To execute any of the commands described in the following sections, insert the appropriate entries in the SOCKET.CFG or another configuration file.

Notations and Conventions

In the command summary, use is made of the *hostid* notation, which denotes a host, router, gateway, or network. *hostid* may be specified either by a symbolic name listed in the HOSTS file, or a numeric IP address with decimal notation; for example, 192.10.240.1.

The following conventions apply to command syntax.

- *italics* indicate that the term is a parameter to be specified by the user.
- [ ] Square brackets indicate that the enclosed item is optional.
- / A forward slash is used as a leading character for an optional switch in some commands. Both the forward slash and the switch that follows it form part of the command syntax. The equal sign before extra parameters is optional in most cases.
- | The vertical bar indicates that there is a choice between two or more selections, but that only one of the options indicated may be specified.
- **bold** type indicates a reserved key word as part of the command syntax and is to be typed exactly as indicated.
- # Commands proceeded by a hash sign (#) are ignored. They are used for comments in configuration files.

Command Reference

---

arp

arp adds a new entry to the Address Resolution Cache. **arp** can also specify the type of ARP used to determine IP address conflicts.

Syntax

arp add hostid ether | ieee hw_addr
arp init {DHCP | GRAT | BOTH}

Remarks

'arp add' includes a new entry in the Address Resolution Cache. Do not add entries with duplicate IP or hardware addresses as this will cause malfunctioning of the network.

'arp init' specifies the type of ARP used to determine IP address conflicts. By default both DHCP and Gratuitous ARPs are sent to determine if the SOCKETS IP address conflicts with any other IP address.

The DHCP and Gratuitous ARP types are slightly different methods of determining IP address conflicts, but each causes a different set of events to occur. In both cases, if a machine is currently using the IP address specified in the ARP packet, that machine will respond to the ARP request which sigals an IP address conflict.

DHCP ARP was designed to be used in conjunction with an IP address received from a DHCP server. A machine could lose it's lease an IP address, but continue to use that IP address. As a result, the DHCP ARP is used to make sure that another machine is not urrently using the specified IP address. Fortunately, the DHCP ARP can also be used with static IP addresses. A difficulty arises when a Proxy Server receives a DHCP ARP packet, the server responds on behalf of the IP address.

A Proxy Server responds to ARP requests for a set of machines that may not always be available for network traffic. If a machine using that IP address is being served by a Proxy Server, even if the DHCP ARP came from a machine being served by a Proxy Server, it responds to the DHCP ARP packet which signals an IP address conflict.

The Gratuitious ARP can also be used to determine IP address conflicts, but it has one major side effect. When a machine receives a Gratuitous ARP packet, and has the requested IP address in it's ARP table, that machine will update it's ARP table to match the hardware address contained in the Gratuitous ARP packet. If another machine is currently using the requested IP address, then that machine can no longer communicate with the network until it sends out another Gratuitous ARP.

By specifying BOTH, a DHCP ARP is broadcast to the network, and if no other machine responds, then a Gratuitous ARP is broadcase to the network. The followup Gratuitous ARP causes APR tables with the requested IP address to be updated with the MAC address with the Gratuitous ARP.

Options

hostid

The IP address of a remote host that is to be added to the ARP cache. This value may be a symbolic name from the HOSTS file or a decimal (dotted) address.

hw_addr

Used with *add* it denotes the hardware (node) address of the remote host whose IP address is given in *hostid*. This must be a six-digit hexadecimal address separated by colons for Ethernet.

DHCP

Used to do only DHCP ARP to determine IP address conflicts.

GRAT

Used to do only Gratuitous ARP to determine IP address conflicts.

BOTH

Used to do DHCP and Gratuitous ARP to determine IP address conflicts. This is the default action.

Example Commands

```
arp add  unix_host  ether  00:00:65:0D:E6:04
arp add  127.0.1.3  ether  00:00:65:0D:E6:04
arp init grat
```

domain

If a host name is not a decimal (dotted) address and it is not found in the HOSTS file and at least one Domain Name Server has been defined, an attempt is made to obtain the address from the defined DNS server(s). The number of times any server is polled (retries), in addition to the time to wait for a response, can also be specified. A suffix may be specified and is attached to all names not containing any dots.

All of the following sub-commands can be issued without the optional parameters to obtain information on the current status.

Syntax

domain server [host_name]

domain retry [retry_count]

domain time [wait_time]

domain suffix [domain]

Remarks

domain server adds a DNS address or lists the current servers if host_name not specified.

domain retry specifies the retry count for polling each server. domain retry lists the retry count if retry_count not specified.

domain time specifies the time (milliseconds) to wait for a response before attempting retry. domain time lists the time (milliseconds) to wait if wait_time not specified.

domain suffix specifies the domain suffix to add to all simple names; names that contains no dots. domain suffix lists the domain suffix if domain is not specified.

Example Commands

```
domain retry 3
domain server 196.2.1.1
domain suffix myorg.co.za
domain time 2000
```

iface

iface is a synonym for the **interface command**.

interface

interface informs SOCKETS of the hardware or software communications interface(s) to be used at the network interface level. At least one network interface is required, and two or more are used in gateway (router) applications.

The class, or mode, of each interface defines the encapsulation used for packaging the data frame into the transport frame. Some types of interface support only one class.

When SOCKETS is defined with multiple interfaces, you first declare an IP address which is associated with the immediately following interface. The defined net mask is then used to add a route through the interface to the connected network. Using the same IP address would result in multiple routes to the same network. The default route is set on the first interface with an IP address with a zero net mask (for example, IP address 19.63.10.11/0).

Each interface command uses the IP address from the last supplied IP address command.

Syntax (general)

interface type name class other parameters

Syntax (specific)

interface pdr name dix mtu numbuf [intvec [irq]]

interface asy name [slip | cslip | ppp] mtu buflim ioaddr iovec speed [modemfile]

interface mdd name [slip | cslip] mtu buflim ioaddr iovec speed [modemfile]

interface aslink name [slip | cslip] mtu buflim ioaddr iovec speed [modemfile]

Options

type

type defines the type of hardware or software interface.

interface supports the following software interfaces.

Interface	Description
asy	Standard PC asynchronous interface (RS232 port)
pdr	packet driver interface

name

name defines the name by which the interface is known on the local host. *name* is a symbolic name known only to the local host on which it is used.

name may be arbitrarily assigned. Each interface command on the same host must have a unique name assigned. This name is used by other commands referring to this interface, e.g. the **param** command.

class

class specifies how IP datagrams are to be encapsulated in the link level protocol of the interface. Some interfaces offer a choice between classes while others use a fixed class. The following classes are available and are listed with their associated types.

Type	**Class** (defined in the following list)
pdr	dix, ieee, token, driver, slip

Type	Class (defined in the following list)
asy	slip, cslip, ppp
mdd	slip, cslip
aslink	slip, cslip

Class	Description
dix	The DEC/Intel/Xerox Ethernet interface also known as Blue Book Ethernet or Ethernet II.
token	IBM Token Ring. Source routing is supported for multiple rings.
ieee	IEEE: 802.3 Ethernet with SNAP headers.
driver	Use the default class for the packet driver.
slip	Serial Link Internet Protocol (SLIP) for point-to-point asynchronous links. This mode is compatible with UNIX SLIP.
cslip	Compressed Serial Link Internet Protocol (SLIP) for faster reaction over point-to-point synchronous links.
ppp	Point-to-point protocol over asynchronous links.

mtu

mtu specifies the Maximum Transmission Unit size, in bytes. Datagrams larger than this limit are fragmented into smaller pieces at the IP layer. The maximum value of *mtu* for the various interfaces is:

Ethernet - 1500

For serial links a standard value for *mtu* is 576. (576 is the maximum according to specifications, but may be increased on reliable connections as long as both sides use the same value.)

numbuf

numbuf specifies how many incoming datagrams may be queued on the receive queue at one time. If this limit is exceeded, further received datagrams are discarded. This mechanism is used to prevent fast interfaces from filling up memory when data cannot be handled fast enough.

buflim

buflim specifies the maximum number of outgoing datagrams or packets to queue before starting to discard datagrams. This mechanism is used to prevent the memory from filling up when a serial link goes down.

bufsize

bufsize specifies the size of the ring buffer in bytes to be allocated to the receiver in raw mode

intvec

intvec specifies the software interrupt number (vector) in hexadecimal to use for resident packet drivers.

ioaddr

ioaddr is the I/O base address in hexadecimal of a serial port or the hardware controller and must correspond with the jumper or switch settings used during the setup of the controller board. The standard values for serial ports are:

COM1 03F8h

COM2	02F8h
COM3	03E8h
COM4	02E8h

iovec

iovec is the hardware interrupt vector used by the serial port or controller and must correspond with the jumper or switch settings used during setup of the controller. The standard values for serial ports are:

COM1	4
COM2	3
COM3	4
COM4	3

irq

irq is the hardware interrupt vector used by the network interface controller. This is only used for faster response in SOCKETS.

modemfile

A file containing the modem commands and scripts.

speed

speed specifies the transmission speed for serial interface devices (baud rate). Before using a serial connection you have to set flow control with the **par** command.

Examples

```
interface pdr if0 dix 1500 5 0x60
interface asy ser0 cslip 576 15 0x3f8 4 9600
interface asy p0 ppp 576 5 0x3f8 4 9600 pppmod.mcf
```

IP

IP displays or sets the values of the options selected when defining the IP (Internet Protocol) host address of the next interface to be defined.

Syntax

IP address [hostid [/net_bits]]

IP status

IP ttl [number]

Remarks

IP address sets the IP host address of the next interface to be defined. A route is automatically added to each interface for the default or specified net mask for it's address. To make an automatic route the default, specify the net bits as zero. When specified without the optional parameters, IP address displays the current value(s) of the local host IP address(es). To assign different IP addresses to different interfaces on the same host, an IP address statement must precede each interface definition. The last IP address given is used in case of missing IP address statements. Three invalid addresses with special meaning may be used: 0.0.0.0 is used to specify that the actual address should be obtained by BOOTP in the case of a LAN connection or by PPP negotiation in the case of

a serial connection. 0.0.0.1 is used to specify that DHCP should be used to obtain an address. 0.0.0.2 is used to specify that the IP address will be assigned by a user-written program and that the address is inactive until the user-written program is run.

IP status displays Internet Protocol (IP) statistics, such as total packet counts and error counters of various types. It also displays statistics on the Internet Control Message Protocol (ICMP). This includes the number of ICMP messages of each type sent or received.

IP ttl sets the default time-to-live value which is placed in each outgoing IP datagram. The ttl value limits the number of gateway hops the datagram is allowed to take in order to kill datagrams that got stuck in loops.

Options

hostid

hostid specifies the IP host address to assign to the next interface to be defined. This may be a symbolic name from the HOSTS file, or a dotted decimal address.

/net_bits

A net mask can be specified for the host. In the **IP address** command an optional */net_bits* can be used to indicate the number of bits in the network ID. The net mask is used to determine whether an incoming datagram is a broadcast and also for sending UDP broadcasts.

Net masks are more easily represented in binary or hexadecimal format. For example, the IP address 128.1.1.5/24 corresponds to a net mask of 255.255.255.0 (FFFFFF00h), 25 bits to 255.255.255.128 (FFFFFF80h) and 26 bits to 255.255.255.192 (FFF FFC0h).

The default net mask used corresponds to the class of address used if not explicitly specified.

Net Bits	Net Mask	Class	IP address range
8	255.0.0.0	A	0.x.x.x to 127.x.x.x
16	255.255.0.0	B	128.x.x.x to 191.x.x.x
24	255.255.255.0	C and higher	192.x.x.x or higher

If you want to subdivide your network, you can divide it by two for every net bit added. The following table provides information on converting between net bits and net mask. The number of net bits to add when changing a 0 in the net mask to:

Net Bits	Net Mask	Net Bits	Net Mask
1	128	5	248
2	192	6	252
3	224	7	254
4	240	8	255

number

When *number* is omitted, **IP ttl** displays the current value of the time to live parameter.

par

par invokes a device-specific control routine. **par** operates differently for each interface type and even interface mode.

Syntax

par ifname [arg1...argn]

Options

ifname

ifname defines the name used in the interface command for the device to be controlled.

arg1...argn

These parameters depend on the type of interface in use.

Example

To change the baud rate of a serial interface and specify software flow control, use:

```
par sl0 19200 x x
```

par, Configuring the PPP Interface

The PPP interface is optionally configured by using the **par** command. Various parameters at the LCP, IPCP and PAP levels can be specified.

Setting PPP Options, Local and Remote LCP/IPCP

When a local option is specified, the value of the option is used in the initial Configuration Request to the peer. Options not specified, are not be requested. For each option, the 'allow off' parameter disallows the peer to include that option in its response. By default, all options are allowed in the response, even if the option is not included in the request.

When a remote option is specified, the value of the option is used in the initial response to the configuration request from the peer. If an option is disallowed, it does not allow the remote to specify that option in its request. By default all options are allowed.

Local and remote options are specified by:

par *iface* lcp|ipcp local|remote *option* [*parameters* ...] [allow [on|off]]

The **par** command options are as follows:

Syntax	Description
par *iface* lcp|lcpin local|remote accm *bitmap*	Set the Asynch Control Character Map. The default is 0xffffffff.
par *iface* lcp|lcpin local|remote authent [pap|chap|none|allow [on|off]]	Set the Authentication protocol. The default is none.

Syntax	Description
par *iface* lcp|lcpin local|remote acfc [on|off|allow [on|off]]	Set Address and Control Field Compression. The default is off.
par *iface* lcp|lcpin local|remote pfc [on|off|allow [on|off]]	Set Protocol Field Compression. The default is off.
par *iface* lcp|lcpin local|remote magic [on|off|*value*|allow [on|off]]	Set the Magic number option (detects looped back circuits)
par *iface* lcp|lcpin local|remote mru [*size*|allow [on|off]]	Set the Maximum Receive Unit. The default is 1500.
par *iface* lcp|lcpin [open|start|listen]	Set the LCP connection mode. *start* is used to initiate a connection as soon as the stack has been loaded. If a modem is used, this will also initiate an immediate dial-out. *open* is used to delay a connection until data needs to be sent. If a modem is used, this provides a dial-on-demand facility. *listen* is used when the peer must initiate the connection. Note that two commands can be given to specify both *open* and *listen* in which case a connection can be initiated from either side.
par *iface* ipcp|ipcpin local|remote adress [*ip_address*>|allow [on|off]]	Set the IP address option. If set to 0.0.0.0, the peer must supply it.
par *iface* ipcp|ipcpin local|remote compress [[tcp *slots* [*flag*]] | [allow [on|off]]]	Set the TCP/IP header compression. *slots* should be equal to the maximum number of concurrent TCP connections. Low values preserve memory. 4 - 16 are good values. *flag* = 0 to not compress the slot number; and =1 to compress. The default is 1.
par *iface* ipv6cp|ipv6cpin local|remote iid [*iid*|allow [on|off]]	Set the IPv6 Interface ID

Setting PPP Options, Retry Counters

The following retry counters can be set:

par <iface> lcp\|lcpin retry <configure>\|<failure>\|<terminate> <count>

par <iface> ipcp\|ipcpin\|ipv6cp\|ipv6cpin retry <configure>\|<failure>\|<terminate> <count>

iface is the name assigned to the interface.

configure is the number of configuration requests (default 20).

failure is the number of bad configuration requests allowed from peer (10).

terminate is the number of termination requests before shutdown (2).

count is the number of retries.

Setting PPP Options, Timeout Values - in milliseconds

par *iface* lcp|lcpin|ipcp|ipcpin|ipv6cp|ipv6cpin|ap|apin timeout *milliseconds*

Setting PPP Options, Authentication - username/password

For PAP or CHAP authentication on PPP connections:

par iface ap user username password

Setting PPP Options, Open - a specified layer

par *iface* lcp|lcpin|ipcp|ipcpin|ipv6cp|ipv6cpin open

Start – an lcp connection

param iface lcp|lcpin start

When **lcp** is specified, a PPP connection is immediately initiated.

Listen – for an lcp connection

param iface lcp|lcpin listen

When **lcpin** is specified, a PPP connection is delayed until an incoming call is detected.

par, Alternative Routing Control Sub-commands

The Alternative Routing Control Sub-commands set up and check the SOCKETS alternative route mechanism. More than one route can be specified to a target host or network. The first route that has an associated interface in the up state is used.

An interface is in the up state when it is defined by the interface command. It enters the query state when it does not receive valid input within a specified up-time period after data expecting a response is sent.. At this stage three (catering for links with a high data loss) ICMP echo requests (ping) are sent to a query IP address. It enters the down state by a SOCKETS command or when it does not receive valid input within the specified up-time period after entering the query state. If an up time has never been specified or a value of 0 is specified, the interface will stay in the up state whether valid input is received or not.

An interface enters the up state by a SOCKETS command or when valid input is received on that interface while it is in the down or query states. An ICMP echo request is sent on an interface in the down state every downtime period. If a downtime has never been specified or a value of 0 is specified, the ICMP echo request is not sent. Up time and downtime is specified in seconds.

Syntax

par ifname [uptime | downtime] time

par ifname query hostname

Options

Ifname

Ifname is the interface name of an asy interface.

Uptime

Uptime is the time to allow for no response on a defined connection.

Downtime

Downtime is the period of time to retry a defined connection.

Example Alternative Routing

Two SLIP interfaces are used to get to the target network 192.6.1.0. The first interface, named if0 should preferably be used, but if it stops receiving for a period of 20 seconds, it should try to ping 192.6.1.2 and if no response is received within another 20 seconds, if1 should take over, but if0 should be tried every five seconds. Interface if1 should disconnect after 80 seconds of no traffic.

The SOCKET.CFG file should contain the following:

```
interface asy if0 slip ...  ...  ...
par if0 uptime 20
par if0 downtime 5
par if0 query 192.6.1.2
interface asy if1 slip ...  ...  ...
par if1 uptime 80
par if1 downtime 5
par if1 query 192.6.1.2
route add 192.6.1.0 if0
route add 192.6.1.0 if1
```

In the case of both if0 and if1 failing, both will retry every five seconds until one comes up. The return paths should also be maintained in a similar way with SOCKETS or by using RIP.

par, COM Port Speed and Flow Control Sub-command

This par sub-command allows the baud rate, flow control and data parameters to be set and is only to be used on asy type interfaces.

Syntax

par ifname speed outflow inflow bits

Options

ifname

ifname is the interface name of an asy interface.

speed

speed sets the baud rate for a serial link. The standard speeds are: 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 and 57600.

outflow

outflow sets the output flow control for a serial link. When not supplied it defaults to none.

inflow

inflow sets the input flow control for a serial link. When not supplied it defaults to none. The following list shows *outflow* and *inflow* selections.

noneno flow control

Xon	Xmit on/Xmit off (Ctrl-Q, Ctrl-S)
DCD	Data Carrier Detect modem signal
CTS	Clear To Send modem signal
DSR	Data Set Ready modem signal
DTR	Data Terminal Ready modem signal
RTS	Request To Send modem signal
ixxx	inverse of modem signal xxx

Invalid selections are ignored or replaced by more logical selections. The usage of Xon/Xoff is not recommended for most applications. The ixxx support is for non-standard equipment that uses a reversed signal on the required pin.

bits

bits sets the number of data bits per character, number of stop bits, and parity for a serial link. It is a three-character string consisting of dsp from the following table. When not supplied, *bits* defaults to value of 81n.

Values for d	5, 6, 7, or 8 data bits
Values for s	1 or 2 stop bits
Values for p	o = odd parity e = even parity n = no parity m = mark s = space

Example

```
par  asy1  57600 cts rts 81n
par  slp0  4800 xon xon 72e
```

par, RIP Advertising Sub-command for Interfaces

When the RIP advertise command has been used, this par sub-command makes allowance to disable and re-enable RIP advertising on a specific interface.

Syntax

par ifname [ripadv | noripadv]

Options

Ifname

ifname is the interface name of an asy interface.

Ripadv

Ripadv indicates to use route advertising on the defined interface.

Noripadv
Noripadv indicates to not use route advertising on the defined interface.

Examples

```
par if0 noripadv
par if1 ripadv
```

printer

The **printer** redirector operates by intercepting Interrupt 17 and passing printer output to a local or remote print server. A print session is started when output is first sent to a specific port, and is stopped after a user-specified period of no output. When a printer port is redirected, the IP address and TCP port number of the destination print server, in addition to the timeout period, is specified. A printer port can both be used as a print server port and as a redirected port.

Syntax

printer printer_port timeout IP_address [TCP_port]

Options

printer_port
Printer port 0, 1, 2 or 3 to redirect. Port 0 corresponds with PRN, 1 with LPT2 and so on. Serial printers can be defined with the SRPRINT.EXE TSR that forms part of the SOCKETS package.

timeout
Timeout period in seconds for closing the TCP connection.

IP_address
IP address of print server host (could be the local host).

TCP_port
TCP port of print server (Default is 10).

Comments

To ensure proper queuing of remote and local print sessions to a local printer, the printer port must be redirected to the local IP address and TCP port of the print server using that port.

Examples

The IP address of print_host in the following example is defined in the HOSTS file.

```
printer 0 15 print_host
```

The following example uses printer port 1 (LPT2) for both local and remote printing. (If the printer command is placed before start prntserv, SOCKETS will not work correctly.)

```
ip address this_host
 .
 .
start prntserv 1010 1
printer 1 15 this_host 1010
```

RIP

The Routing Information Protocol (RIP) allows a SOCKETS gateway to advertise routes and allows SOCKETS to recognize advertised routes from SOCKETS and other gateways. These two facilities can be individually selected.

Syntax

RIP advertise [time [1|2] [self]]

RIP use [time]

Options

time

time is the number of elapsed seconds before the advertisement is repeated when used in the advertise sub-command.

time is the period during which routes are added or amended as a result of RIP, and are valid for *time* seconds. Such added or amended routes are dropped if another RIP advertisement is not received within *time*.

self

self advertises SOCKETS connection to the network.

RIP Advertise Sub-command

RIP advertise causes an immediate advertisement of all relevant routes and repeats it every time seconds. The default value for time is 30 seconds. RIP version 2 advertisements are sent by default. To send only version 1 advertisements, add a 1 on the command line.

When RIP advertise is selected, all interfaces advertise all routes except those routes making use of that specific interface (split horizon) and routes marked Private. (To prevent certain interfaces from using RIP, see the parameter command.) A route which is dropped as a result of a RIP update or which becomes unavailable as a result of its associated interface going into the down state, is immediately advertised as being infinite (metric = 16) and is not advertised until it becomes available again. The advertisement is sent as a sub-net broadcast using the net mask and IP address of the interface.

Example

```
RIP advertise 30 self
```

RIP use, Update RIP Sub-command

RIP use causes a RIP request for routes and a continuous update of routes according to RIP advertisements. Routes added or amended as a result of RIP are valid for time seconds and are dropped if another RIP advertisement is not received within that time. The default value of time is 240 seconds.

When RIP use is selected, routes are updated according to received RIP advertisements. Routes added or amended as a result of RIP, have a timeout associated with them. If another RIP advertisement is not received during that time, the route is dropped. A route

is also dropped if an advertisement of infinity (metric = 16) is received. To prevent dropping a route, it must be marked as Static.

On RIP and static routes: — The metric of a route marked static is never updated by a RIP advertisement. Instead a duplicate route is added before the static route. If the duplicate route is dropped as a result of a timeout or RIP, the static route is used again.

On RIP and mdd or x25 interfaces: — On mdd or x25 interfaces, a RIP route is only sent when the last datagram was not a RIP route. This is done to allow an interface to time out and be disconnected when not used.

Also, the route on the receiving end still times-out and becomes unavailable. This means that inactivity timers should be shorter than route timers; as specified in RIP use timer.

When an aslink to mdd association is broken, all non-static routes using the specific mdd are marked as having a hop-count of infinity; the metrics are set to 16.

route

route creates an entry in the IP routing table for SOCKETS to determine where to send data. The Alternative Routing mechanism allows more than one route to be specified to a particular host or network. Failure of one route causes an automatic switch to the next route.

Refer also to the **ip** address command for specifying the net mask, because a route is automatically added to each interface for the default or specified net mask for that address. When multiple routes are defined to the same address, SOCKETS uses the route with the network size (largest number of bits in the net mask).

Syntax (general)

route [add | drop destination ifname [gateid |none [metric [proxy] [private] [static]]]]

Syntax (specific)

route

route add [hostid | netid] ifname [gateid]

route add [hostid | netid[/mask]] ifname [gateid]

route add default ifname

route drop [hostid | netid]

route drop [hostid | netid[/mask]]

route drop default

Options

add or drop

Sub-command to add or drop (remove) a route from the routing table.

default

All transmissions to IP addresses not otherwise defined in routing commands are sent via the network interface specified by *ifname*.

hostid

hostid is the IP address of a destination remote host to which data must be sent, or a remote host that must be removed from the routing table (dropped).

netid

netid is the IP address of a destination network to which data must be sent. Any host with this IP network address is able to receive the data. Whether a particular host will use the data depends on the host portion of the specific IP address in the IP header.

mask

mask specifies the number of bits in the network portion of the address if sub-netting is used. If not used, the network portion of the address is determined according to the class (A, B or C) of the address.

ifname

ifname defines the name used in the interface command for the immediate network on which the data for the designated host must be sent. This is the network level interface to be used by the local host to reach the remote host.

gateid

gateid parameter specifies the IP address of a host, on the same physical network as the local host, which is used as a gateway or router to a different network. The gateway or router host specified in *gateid* must be directly reachable on the same physical network as the local host defining this gateway. In other words, this must be the nearest gateway to this local host.

metric

When using RIP or Proxy ARP a value from 0 to 16 for *metric* must be specified indicating the distance or cost of that route. A *metric* of 16 indicates that the route is down.

proxy, private and static

To support the Routing Information Protocol (RIP) the route command utilizes the proxy, private and static key words. These words can be used in any order following *metric*.

Proxy ARP should be used with care and not in conjunction with RIP. When more than one host responds to an ARP request, it can cause confusion and even lead to system crashes. This is possible in situations where more than one gateway implements Proxy ARP to a common destination. See also ROM-DOS Developers' Guide, "About TCP/IP" for more information.

When "RIP advertising" is selected, all interfaces advertise all routes except those routes making use of that specific interface (split horizon) and routes marked private. A route which is dropped as a result of a RIP update or which becomes unavailable as a result if its associated interface going into the down state, is immediately advertised as being infinite (metric = 16) and is not advertised until it becomes available again. In order for an interface to be used for advertising, a route without a gateway using that interface must be available. The advertisement is sent as a sub-net broadcast using the net mask of the host and the IP address of the interface.

When "RIP using" is selected, routes are updated according to received RIP advertisements. Routes added or amended as a result of RIP, have a timeout associated with them. If another RIP advertisement is not received during that time, the route is dropped. A route is also dropped if an advertisement of infinity (metric = 16) is received. To prevent dropping a route, it must be marked as static. The

metric of a route marked static is never updated by a RIP advertisement. Instead a duplicate route is added before the static route. If the duplicate route is dropped as a result of a timeout or RIP, the static route is used again.

Examples

```
route add default ipx0
route add unix_net eth0
route add unix_host ipx1 unx_gate
route add unix_net2 eth0 /eth 1
route add unix_ net ipx0 unx_ gate
route add subnet/26 eth0 sub_gw
route drop unix_net
```

route can specify a Proxy ARP on a route, as follows:

route add net interface gateway metric [proxy]

When using Proxy ARP, gateway and metric must be specified. If no gateway is used, none can be specified. For example:

```
route add 192.6.1.0 ifx25 none 5 proxy
```

start

start starts a SOCKETS Print server (prntserv) or LPD and makes it available for access by remote hosts.

Syntax

start prntserv [port [printer_number]] [/m=mask] [/s=status] [/r=report] [/d=print_delay]

start lpd [printer_number] /n=printer_name [/m=mask] [/s=status] [/r=report] [/d=print_delay] [/f]

Options

port

port is the TCP port to use (the default is 10)

printer_number

printer_number is a value of 0, 1, or 2 to correspond with LPT1(PRN), LPT2 and LPT3. Any number up to 3 may be defined by the serial printer TSR (SRPRINT) as a printer on a COM port. The default printer number is 0.

Note: Both **LPD** and **prntserv** may use the same printer.

printer_name

The name of the printer queue.

mask

Used to activate status reporting and cope with non-standard printer status reporting.

status

Used to activate status reporting and cope with non-standard printer status reporting.

report

Used to activate status reporting and cope with non-standard printer status reporting.

print_delay

A decimal number specifying the number of times a printer will be tested for busy status before the busy status is accepted. This solves the problem that a single character is sent to the printer every timer tick (55 milliseconds), resulting in extremely slow printing by the print server. *print_delay* should be the lowest value still permitting fast printing. The default value is 40 which works fine on a 33 Mhz 386 CPU. On a slower CPU the value can be less and on a faster CPU it may need to be more.

/f

Send a form-feed (new page) to the printer at the end of the print job.

Printer Status Reporting

Optional status reporting has been implemented to give print client implementations more control over print jobs. The following print server enhancements have been enabled:

1. Optional status reporting to Print Client. The status reporting includes messages like:
   Timeout
   Last character has been sent to printer
   I/O Error
   Printer selected
   Out of paper
   Acknowledged
   Printer Ready
2. Customization of printer status checking.
3. Print queue flushing.

Raw printer status bytes as defined for BIOS INT 17 services can be sent from the server to the client on the established connection when:

1. The first data is being printed.
2. The status changes while attempting to print.
3. The last character in the stream (the character before the FIN) has been sent to the printer. The unused bit Bit1 in the status is used to indicate this event.

The status byte is defined as follows:

Bit7	80h	Printer ready
Bit6	40h	Acknowledged
Bit5	20h	Out of paper
Bit4	10h	Printer selected
Bit3	08h	I/O Error
Bit2	04h	Unused
Bit1	02h	Last character has been sent to printer
Bit0	01h	Timeout

The status bits are returned by the Int 17 BIOS call (with the exception of Bit1) and are not always consistent, but depend on the BIOS of the particular server.

To print successfully, three conditions must be met: 1) the printer must be selected, 2) be ready, and 3) contain paper.

Sum the hexadecimal values for these conditions and use that as the /s and /m parameters for the start prntserv commands. The default values used are /mA8 for the mask and /s80 for the status which implies that data is sent to the printer when it is not busy and out-of-paper, or I/O Error status is not set. Printer selected is ignored as this status bit is often not reported correctly. To include the printer selected bit, specify /mB8 and /s90.

Example

```
start prntserv 10 0
```

Notes on SOCKETS printing

The socket print server accepts TCP connections and routes output to one of four system printers on a parallel port or serial port. Up to four print servers can be started on different TCP ports, connecting to different printers. The server accepts multiple calls, but prints strictly in order of received calls. This means that a connection must be closed to allow another client to print, thereby providing print queuing. There is no indication of queuing status, so a non-ready printer will not hang SOCKETS. Other operations are not affected.

The print server is instructed to send status bytes in the start prntserv command by specifying an optional argument /r=report where report is a hexadecimal value specifying the status bits which are checked for changes to initiate a report. (A report is always sent at the beginning of a job.) The default value is 0 that means that the print server will not report any status changes. A logical value to use is /r=3F which causes any changes, except Printer ready and Acknowledged, to be reported. (The Acknowledged bit is not useful in this application because it toggles at each character; too fast for most networks to carry all the generated traffic.) Note that the full printer status byte is transmitted without filtering any bits.

Notes on printing

Provision is made for non-standard status responses from printers. The *mask* specifies a hexadecimal value to perform a logical AND operation with the status indication from the printer and *status* is the hexadecimal value of the result which causes the printer to print. These options are only used locally at the server and the result is not passed on to the client. Change these options only when error conditions (for example, printer switched off or printer off-line) causes output to be lost. The default values used are 0xA8 for the mask and 0x80 for the ready status which implies that data is sent to the printer when it is not busy and Out of paper or I/O Error status is not set. Note that Printer selected is ignored as this status bit is often not reported correctly. To include the Printer selected bit, specify /m=B8 and /s=90.

tcp

tcp commands display or set various TCP operating parameters.

Syntax

tcp ackonpush 1

tcp irtt [time]

tcp lport [port_number]

tcp mss [size]

tcp retry [number]

tcp rtt [time]

tcp smss [size]

tcp timemax [time]

tcp window [size]

Options

time

time is the new time value in seconds, or milliseconds if "ms" is appended to the number, as in 2000ms.

port_number

port_number is the local port starting number.

size

For **tcp mss**, *size* is the maximum segment size in bytes sent on all outgoing TCP connect requests (SYN segments). *size* tells the remote host the size of the largest segment that may be received by this host. When changing the MSS value, any existing connections remain unchanged.

For **tcp smss**, *size* is the send maximum segment size in bytes sent on all outgoing TCP connect requests. This limits the size of the largest segment that may be sent by this host. When changing the SMSS value, any existing connections remain unchanged.

For **tcp window**, *size* is the size of the receive window in bytes for any new TCP connections. Existing connections are unaffected.

number

number is the number of retries attempted without receiving an acknowledgement from the remote host before the connection is broken. If the value exceeds 255, it implies an infinite number of retries; such a connection does not time-out. The default value for *number* is 6.

tcp ackonpush Sub-command

tcp ackonpush disabled "Delayed ACK". Normally TCP acknowledment should occur as RFC1122 states:

"4.2.3.2 When to Send an ACK Segment

A host that is receiving a stream of TCP data segments can increase efficiency in both the Internet and the hosts by sending fiew than one ACK (acknowledgment) segment per data segment received; this is known as "delayed ACK" [TCP:5].

A TCP SHOULD implement a delayed ACK, but an ACK should not be excessively delayed; in particular, the delay MUST be less than 0.5 seconds, and in a stream of full-sized segments there SHOULD be an ACK for at least every second segment."

The purpose of using "delayed ACK" is to decrease the amount of traffic generated on a TCP connection. In certain applications a delayed ACK can lead to a slower response. The user can now disable the "delayed ACK" functionality by using this command in the SOCKETS configuration file.

ACKONPUSH can be abbreviated to ACK.

Example

```
tcp ackonpush 1
tcp ack 1
```

tcp irtt Sub-command

tcp irtt displays or sets the initial round-trip-time estimate. When specified without an argument, the command displays the current values of TCP parameters including the initial round-trip-time in milliseconds.

time is the initial round-trip-time (IRTT) estimate and is used for new TCP connections until the actual value can be measured and adapted to. By increasing this value when operating over slow communication links, unnecessary retransmissions that otherwise occur before the smoothed estimate value approaches the correct value are minimized. The system default is 5000 milliseconds.

To affect incoming connections, tcp irtt should be executed before the servers are started.

Example

```
tcp irtt 120
```

Sample Output

```
TCP: IRTT 5 ms Retry 6 MSS 1460 SMSS 1460 Window 2920
```

tcp lport Sub-command

tcp lport specifies the local port starting number. When specified without a number the current value of the next free local port number is displayed.

Example

```
tcp  lport  2004
```

Sample output

```
lport = 2004
```

tcp mss Sub-command

tcp mss displays or sets the TCP maximum segment size in bytes. When size is not specified, the current values of the TCP parameters, including the maximum segment size, are displayed. It is recommended to reduce the MSS and SMSS on bad network connections. The SOCKETS queuing overhead is 12 bytes per WriteSocket request i.e. you will need 52 bytes for each request. It will queue 2*MSS bytes for you if it can't send right away because of window constraints by the peer or the Nagle heuristic. That means that if your MSS is set to the default of 1460, 2920 bytes will be queued, consuming 3796 bytes in your case. If you have 5 connections, you need 18980 bytes just to buffer your outgoing data. Use IPSTAT to determine how much memory you have available for everything. (You need memory for each connection, incoming data and all other TCP functions).

Example

```
tcp mss 1460
```

tcp retry Sub-command

tcp retry displays or sets the retry count before a connection is broken. When specified without the number parameter, tcp retry displays the current values of TCP parameters, including the retry count. Refer also to "**TCP Retry Strategy**" on page 265.

tcp rtt Sub-command

tcp rtt replaces the automatically computed round-trip time (RTT) for the specified connection with the time in milliseconds. SOCKETS calculates the RTT as a smooth average of past measured RTTs, starting with the IRTT on a new connection. To get the current RTT in use for a connection n, use the tcp status n command that gives the smoothed average RTT indicated by SRTT. Because tcp rtt provides a manual override of the normal back-off retransmission timing mechanisms, it may be used to speed up recovery from a series of lost packets.

Example

```
tcp rtt 4 100
```

tcp smss Sub-command

tcp mss displays or sets the TCP send maximum segment size in bytes. When size is not specified, the current values of the TCP parameters, including the SMSS, are displayed. A small SMSS causes the remote to reduce its segment size. tcp mss can reduce the MSS and SMSS on bad network connections with high loss rates or where large packets get lost.

Example

```
tcp smss 512
```

tcp window sub-command

tcp window displays or sets the default and maximum receive window size. When specified without the size parameter the current TCP parameters, including the current window size, are displayed.

Example

```
tcp window 2920
```

tcp timemax Sub-command

tcp timemax sets the maximum duration of a tcp retry. If a value greater than 255 seconds is specified, connections never timeout. This is very useful in wireless applications where nodes roam in and out of service.

Example

```
tcp timemax 2000ms
```

SOCKETS command line options

The command line options for SOCKETS, SOCKETM and SOCKETP are identical.

Syntax

Sockets [/options…] [*config_file* [*arguments_for_ config_file…*]]

Options

/?

/0

/a

/n=*normal_sockets*

/i=*capi_interrupt*

/d=*dos_compatible_sockets*

/h

/m=*memory_size*

/p

/s=*stack_size*

/v=*api_interrupt*

/q

/u

config_file

The configuration file to use.

If *config_file* is omitted, SOCKETS searches the following paths:
%SOCKETS%\DOS\SOCKET.CFG
%SOCKETS%\SOCKET.CFG
SOCKET.CFG

If the SOCKETS environment variable is not set, %SOCKETS% above defaults to \DL\SOCKETS

arguments_for_ config_file

Can be used to replace %1 to %9 in the configuration file. It is often used to set the IP address or other variable parameters in the configuration file. It can also be used to simplify many functions.

/?

/h

Displays help about command line options.

/0

Instructs SOCKETS to not attempt to save and restore the extended register set of an 80386 processor. This is the only 386-specific code in SOCKETS/DOS, and disabling it makes SOCKETS/DOS fully 80186 compatible.

/a

Instructs SOCKETS to enable the reception of Multicast packets by the Packet Driver. Use this when using multicast functions.

/a2

Instructs SOCKETS to ignore the reception of locally looped-back Multicast packets by the Packet Driver. This is required to run IPv6 Sockets on a Windows system using NDIS3PKT.

/n=normal_sockets

The number of normal sockets to reserve for use by the Compatibility API. If that API is not needed or no normal socket function is used, set this to 0. This value defaults to 8 i.e. /n=8.

/d=dos_compatible_sockets

The number of DOS compatible sockets to reserve for use by the Compatibility API. If that API is not needed or no DOS compatible function is used, set this to 0. Note that the TCP/IP SOCKETS API (BSD) does not use any DOS compatible sockets. This value defaults to 12 i.e. /n=12.

/i=capi_interrupt

The compatibility API uses interrupt 61hex i.e. /i=61 To change it to a different value, specify the value in hexadecimal eg. /i=62.

/v=api_interrupt

The SOCKETS API normally uses interrupt 7Fh i.e. /v=7fTo change it to a different value, specify the value in hexadecimal eg. /v=7e.

/m=memory_size

Specifies the working memory or heap size for SOCKETS and has a default value of 16384 (16KB) for SOCKETP and 22528 (22KB) for SOCKETM. Increase this value if IPSTAT shows Memory allocation failures during operation.

/p

Sets the minimum size for allocation requests from packet drivers to 64 bytes. Some packet drivers request a specific amount of memory, but proceed to write a minimum of 64 bytes to the allocated memory space.

/s=stack_size

Specifies the stack size used by SOCKETS and has a default value of 2048 (2k). Increase this value if problems are experienced when using nested Async Notification handlers.

/q

Load SOCKETS without displaying any startup messages or diagnostics.

/u

Run SOCKETS with the /u switch to unload it from memory. If another program has taken over the interrupts SOCKETS has hooked, SOCKETS just disables itself when the /u switch is used.

Modem Configuration File Syntax

A modem configuration file is a text file containing lines defining modem “scripts” defining the operation of a modem to make and receive calls. A modem configuration file can be given any name which is referenced in the **interface** command.

A modem configuration file consists of separate commands lines, each starting with one of the following characters in the first column:

i	***initialisation string/script*** (for the modem)
m *time*	**modem pacing -** send a script character to modem every ***time*** milliseconds. Default is 55 ms. Use m 0 for no pacing.
n	***telephone number*** to dial (one number per line)
r	***retry_count*** (when a connection or script failed)
x	***exchange_id*** (XID for user identification)
d	***dial command/script*** (talk to modem till connected)
a	***answer prompt script*** (answer incoming call)
c	***connect string/script*** (initiate outgoing call)
h	***hangup string/script*** (end the call)
p	***parameters*** (for debugging/watching and dial control)
t *time*	**timeout value -** Lower DTR for ***time*** milliseconds to disconnect modem. Default is 10,000 milliseconds.
b	***command_character*** (default is @ in this syntax)
#	***comments*** (what all good programmers do)

parameters comprise of an optional string specifying whether dial communications must be displayed and how it must be controlled. Use **x** to display transmit data and **r** for received data. The display is only active while DCD is low. Use **d** to always dial when DCD is or becomes low. Use **n** for no dial on demand. Note that **d** and **n** are mutually exclusive. To specify that no DCD signal is available use a **c.**

The *initialisation* ***strings***, ***answer prompt***, ***connect string, dial commands*** and ***hangup string*** consist of modem and login commands or prompts and special functions to cause delays and wait for DCD or strings. The simple scripts are one line strings where commands start with the ***command_character*** (default is @) followed by a script command, followed by a time in milliseconds (and a receive search string in the case of **@r**). The following script commands can be used:

@t *time*	
@w ***time***	wait for the full ***time*** specified
@d ***time***	wait for DCD (modem to get connected)
@f ***time***	wait for ^F XID ^M and find **mdd** with the matching XID
@a ***time***	wait for IP Address (anywhere in data stream) and use it as your own for this interface
@r ***time string***@	wait for ***time*** to receive ***string***
time@***string***@	terminate ***time*** if followed by a string starting with digits
string	send ***string*** to modem/remote (default in all scripts)
@n	insert telephone number (used in dial string)
@x	insert XID (used in connect string)
@@	send ***command_character*** (@) to modem/remote

Note:

- The ***time*** is given in milliseconds and is terminated by the first character that is not a decimal digit. Maximum ***time*** is one hour (3 600 000ms).
- The script is aborted when a conditional wait times out, without making the connection.
- Receive strings (**@r**) are terminated with a ***command_character*** (@).

- Send strings are terminated with the next command or the end of a line. A carriage return character (CR) is not automatically added.
- To put control characters in the string use ^***n*** where ***n*** is A for 0x01, B for 0x02 and so on. A CR is ^M and a LF is ^J. Use ^***SPACE*** to send the ^ character to the modem.
- Do NOT include spaces as separation characters since all characters are interpreted.
- The @'s are strictly interpreted from left to right - do not confuse them with terminating and initiating @'s. After **@r,** a terminating @ must follow. An initiating @ for the next command MUST be given - it is not automatically assumed since a send string is implied by default.

Modem dial and answer process

Here is a brief discussion of the modem dial and answer processes:

The **i**nitialisation script line is executed when Sockets starts up, when a script fails to complete after re-tries and after a modem connection has been broken.

The **d**ial script line is executed when data is to be sent and dial-on-demand is active, when dial-when-not-connected is active (specifiedby 'd' in the (p)arameter line) or when the user program requests a dial using IfaceIOCTL().

The **c**onnect script line is executed when (d)ial completes successfully.

The **a**nswer script line is executed when a DCD signal is available and DCD is raised without a **d**ial operation in progress or when a DCD signal is not available and data is received with the modem in an idle state.

The **h**angup script line is executed whenever the modem connection must be terminated. If no **h**angup line is given, DTR is used to terminate the modem connection.

The modem is ***connected*** when the **c**onnect or **a**nswer script completes successfully or when **d**ial completes in the absence of a **c**onnect line or the **a**nswer script would have been executed, but had not been specified.

Example

`@w1000`	wait for 1 second
`@d30000`	wait for DCD, retry dial after 30 seconds.
`@@`	send @ to modem/remote
atdt`@n^M^J`	dial the next number in the list
`@r2000login@`	wait for the string "login"

An example or two is the fastest way to understand the explanations above. For a simple connection where no passwords or identity checks are needed, try the following:

```
# Modem definitions for Zoltrix Hayes compatible modem
# This example is for 'asy' interfaces making outgoing
# connections with no logon sequence.
```

```
#
# initialisation string
# (Warning: consult the manual for your own modem)
# send "a", wait half a second, send "a", wait half a second,
# send "ats0=0" - do not use auto answer
# send "&c1" - use state of carrier for DCD
# send "&d3" - disconnect when DTR low
# send "&k3" - enable RTS/CTS flow control
# send "&q5" - select error correction
# send "<CR><LF>", wait 100 milliseconds
i a@w500a@w500ats0=0&c1&d3&k3&q5^M^J@w100
#
# dial command - send "<CR><LF>", wait 2 seconds
# send "atdt<number><CR><LF>"
# wait 30 seconds for DCD
d ^M^J@w2000atdt@n^M^J@d30000
#
# two numbers to dial in rotation
n 790-1234
n 790-1235
#
# parameters: r=show modem receive, x=show modem xmit
p r
#
# number of retries
r 5
```

A more typical login sequence (where a user ID and password is required) will use the connect script as in this example:

```
# modem definitions for US Robotics Hayes compatible modem
# send "a", wait a tenth of a second
# send another "a", wait a tenth of a second,
# send "at&c1" - use state of carrier for DCD
# send "&d3" - disconnect when DTR low
# send "&i0&r2&h1" - enable RTS/CTS flow control
# send "&m4" - select error correction
# send "s0=0" - do not use auto answer
# send "<CR><LF>", wait 100 milliseconds
i a@w100a@w100at&c1&d3&i0&r2&h1&m4s0=0^M^J@w100
# number to dial
n 03456789
# number of retries
r 4
#
# dial command - send "<CR><LF>", wait 1 second
# send "atdt<number><CR><LF>"
# wait 40 seconds for DCD
d ^M^J@w1000atdt@n^M^J@d40000
#
# connect script - wait 7 seconds for login prompt
# send user ID, wait 2 seconds for password prompt
# send password, wait 2 second for acknowledgement
c @r7000ogin@myuserid^M@r2000sword@mypassw^M @r2000Welcome@
# parameters: r=show modem receive, x=show modem xmit
p rx
```

Note that the '@m's in the above connect string are not commands since the @ is interpreted as the end of a **@r** 'wait for receive' string. Sometimes you would have two @'s like this example: Should you want to put a small delay before replying to a prompt it would contain @@ as follows:

```
c @r7000ogin@@w100myuserid^M
```

A typical **d**ial script line when DCD is not available, would be:

```
d ATDT@n^M@w20000CONNECT@
```

The modem will be ***connected*** when **CONNECT** is received within 20 seconds after sending the dial string and no **c**onnect is specified.

A typical **a**nswer script line when DCD is not available, would be:

```
a @r10000RING@
```

The modem will be ***connected*** if **RING** is received within 10 seconds after receiving input. It is recommended to always specify an **a**nswer script line when DCD is not available since any noise on the line while the modem is ***idle***, will be regarded as an incoming connection which will make it impossible to dial without disconnecting first. If no incoming call is to be accepted, use an answer string which will fail quickly e.g:

```
a @w100Wait 100 milli-seconds for this unlikely string!@
```

In this case it would be prudent to disable modem auto-answering in the **i**nit string as well.

For receiving incoming calls, the **a**nswer command/script is used. You can use it to do a single user ID/password controlled login, just a user ID login, or unconditional acceptance. The more general case is to use **mdd** interfaces with an XID (exchange ID) to validate multiple users. Examples for using Multi Destination Drivers (MDD) are given below. If your SOCKETS workstation accepts only incoming calls, you do not need to enter dial commands.

Retry Strategy on Time-out

For outgoing calls, when a wait for DCD (@d) times out without receiving DCD, SOCKETS will drop the call (by lowering DTR). If the number of retries has not been exhausted, SOCKETS will retry the dial command with the next phone number rotating through the list of numbers. If a connection with the remote modem is successful (received a DCD) and there is a timeout on the wait for ***string*** command in the connect script, the connect script is re-started for the number of retries specified. If the number of retries has been exhausted, SOCKETS will retry the dial and connect commands only after being prompted again by receiving traffic for this destination host or net.

For incoming calls, when there is a time out on the wait for XID or ***string*** commands, the answer-prompt script is re-started for the number of retries specified. If the number of retries has been exhausted, SOCKETS will drop the call by running the **h**angup command or by lowering DTR.

Delayed LAN configuration

This feature allows an ethernet connection to be initialized by the application when the connection is required. This allows the SOCKETS configuration parameters to be read from a device, such as EEPROM. To do this, SOCKETS is configured with an "inactive" IP address of 0.0.0.2.

The SOCKETS configuration file will look something like the following:

```
# assign "inactive" IP address

ip address 0.0.0.2

# configure the interface

iface pdr if0 dix 1500 10

# display the assigned IP address

ip address

# display the default route

route

# display the Initial Round Trip Time value

tcp irtt
```

A utility, DCONFIG.EXE, is provided with source code as an example of how an application can configure the ethernet connection. DCONFIG.EXE and the corresponding source file, DCONFIG.C, can be found in the UTILS folder of the SOCKETS directory tree.

Multi Destination Drivers

When you have more than one destination to or from dial-up links using SLIP, and are using more than one modem, you need a mechanism to link the logical interface (with IP address and routing info) to the physical interface (COM port with modem definitions). Using an **asy** type interface permanently links the logical and physical interface with one IP address. This works OK for dialling out to multiple destinations only where you are the end user and nobody routes through you.

Two interface types - **mdd** and **aslink -** have been defined to enable dial-up operation to other networks using SLIP.

- **mdd** defines a logical interface with associated IP address, routes, MTU, buffer limit and a modem configuration file but without a physical interface. For each dial-up destination a **mdd** interface is created, and a route to each destination specified.

- **aslink** interface defines an uncommitted asynchronous interface with an associated COM port as specified by the I/O address, and interrupt vector.

When initial traffic is to be sent to a destination through a **mdd** interface, SOCKETS scans all **aslink** interfaces for the first available one and assigns it to the **mdd** interface. This association is broken when the dial connection is broken or when the dial attempt fails. A dial attempt fails when the retry count specified in the modem file expires.

Incoming calls can be received on any **aslink** interface. This interface must then be associated with the correct **mdd** interface (and IP address with route) for the calling host. An exchange identifier (XID) defined by both the calling host and the called host achieve this.

The protocol for exchanging the XID is implemented partly by SOCKETS and partly by the user defined 'connect' and 'answer' scripts in the modem configuration files. When an incoming call is received by an **aslink** interface, as seen when DCD is raised, the 'answer' script is executed. This script must contain a command to wait for the XID and match it to a local **mdd** containing the same XID and an acknowledgement to the sender that the exchange has been successful. The XID *must* be preceded by an ACK (^F) and followed by a CR (^M). The 'connect' script of the calling host is used for this purpose. The following 'answer' and 'connect' scripts may be used:

```
a @w100^M^JYour ID?@f1000ccc
```

This means: Wait for 100 milliseconds (after receiving the DCD) send a CR/LF to write on a new line and prompt the user with 'Your ID?' Wait 1 second to receive a valid XID matching with an **mdd** interface and then send a few 'c's to acknowledge 'connected' for the caller.

```
c @r500ID?@^F@x^M@r500c@
```

This means: Wait half a second to receive the 'ID?' prompt, send the required ACK (^F), XID (@x) and CR (^M). Wait another half second for acknowledgement from the remote with a 'c'.

It can occur that a request for making an outward connection and an attempt by an incoming connection clash at the same **mdd** interface. One example is when a connection is broken and both sides redial each other to restore the connection. A mechanism must be used to allow only one of the attempts to be successful. Therefore a **mdd** interface will drop an **aslink** trying to make an outgoing connection as soon as it senses another **aslink** trying to connect to it with an incoming connection.

In summary the modem commands used by the **mdd** and the **aslink** in their respective modem files for the following functions are:

- For initiating the modem: Always use the '**i**-' command in the **aslink** modem file.
- For making a call: Use the telephone numbers from the **n**-command in the **mdd** modem file, select any available **aslink**, and use its **d**-command. When the modems are connected, use the **c**-command in the **mdd** modem file to logon with its XID (**x**-command).
- For answering a call: Use the **a**-command in the **aslink** modem file to query the user for his XID (logon sequence), find the **mdd** modem file with the matching XID (**x**-command).

More examples are available in the HAYES.MOD file. See the command descriptions in the **Modem Configuration File Syntax** section above.

Example

An **mdd** modem configuration file for both incoming and outgoing connections:

```
n 790-1234
n 790-1235
x id-abc
```

```
c @r20000ID?@^F@x^M@r500c@
r 5
```

An **aslink** modem configuration file for both incoming and outgoing connections:

```
i a@w500a@w500ats0=1&c1&d3&k3&q5^M^J@w100
a ^M^JYour ID?@f5000@w200ccc
d ^M^J@w2000atdt@n^M^J@d30000
r 5
```

Example

An **aslink** modem configuration file for incoming connections:

```
i a@w500a@w500ats0=1&c1&d3&k3&q5^M^J@w100
a ^M^JYour ID?@f5000@w200ccc
r 5
```

An **mdd** modem configuration file for incoming connections:

```
x id-abc
```

Example

An **mdd** modem configuration file for outgoing connections:

```
n 790-1234
n 790-1235
x id-abc
c @r20000ID?@^F@x^M@r500c@
r 5
```

An **aslink** modem configuration file for outgoing connections:

```
i a@w500a@w500ats0=0&c1&d3&k3&q5^M^J@w100
d ^M^J@w2000atdt@n^M^J@d30000
r 5
```

Configuration Considerations

MTU (Maximum Transmission Unit)

The MTU is the maximum size in bytes of a data packet (including all IP and TCP header information.) Information is sent across the Internet in packets, which are reassembled into a whole when they reach their destination. The size of these packets is dependent on the MTU of the machines along the route the packets travel.

The MTU can be specified by each individual computer. When you send out a request for information, the computer you are are requesting information from will read your request and hopefully send out packets of the size that you request. If the destination machine has a smaller MTU, the packets will be broken into pieces, or fragmented.

MSS (Maximum Segment Size)

MSS is the maximum size in bytes of the data portion of a TCP/IP packet This value is normally the MTU setting minus 40. MSS is used by SOCKETS to determine the WriteSocket queue size. The SOCKETS queuing overhead is 12 bytes per WriteSocket request so you will need 52 bytes for each request. SOCKETS will queue 2*MSS bytes if it can't send right away because of window constraints by the peer or the Nagle Algorithm. This means that if your MSS is set to the ethernet default of 1460, 2920 bytes will be queued, consuming 3796 bytes with overhead per connection. If you have five connections, you need 18980 bytes just to buffer your outgoing data. Use IPSTAT to determine how much memory you have available. (You need memory for each connection, incoming data, and all other features of the TCP/IP stack).

Buffers

Buffers are used to store data packets that are sent and received. The size of each buffer is determined by the MTU setting. Additionally, SOCKETS adds an additional 12 bytes for each WriteSocket request. The maximum amount of memory required for buffers is determined by the following formula

Maximum Buffer Memory Use = MTU * Buffers

A buffer limit of 30 is excessive if you have 1500 byte buffers (1500 * 30 = 45000). By default, SOCKETS allocates 20000 bytes, which is used for a lot of other processes as well, so you are bound to encounter out-of-memory situations. If you set MTU to 1500, then 5 would be a recommended setting for the number of buffers.

Chapter 13, SOCKETS Configuration Examples

The following examples within this chapter refer to specific files, such as "EXAMPLE1.CFG" and "MODEM.MC2". These example files can be found in the \SOCKETS\CONFIGS directory created during the install process.

- Ethernet connection with SOCKETS acting as a server to a Win9X or NT system. The DL web server can be launched and a standard desktop browser will "surf" to the SOCKETS system.
- Dial-Up serial connection to an ISP.
- Single Dial-In Connection.
- Single Dial-In connection with ASY interface.
- Direct serial connection with SOCKETS as a server.
- Direct serial connection with SOCKETS as a client.
- Dial-up slip connection with SOCKETS as an IP router.
- Multiple dial–in connections.

Example 1: Ethernet Connection – SOCKETS Serving a Web Page

SOCKETP is loaded from the command line as follows:

SOCKETP.EXE EXAMPLE1.CFG

To demonstrate the web interface, next launch HTTPD.EXE. If the index file is not within the current directory please remember to set the environment variable HTTP_DIR to the location of the index files or nothing will be displayed to the desktop browser.

```
SET HTTP_DIR=C:\DL\SOCKETS\SERVER

HTTPD.EXE /R
```

The configuration file EXAMPLE1.CFG contains:

Ip address 196.6.1.111/24	Sets an IP address of 196.6.1.111 with a 24-bit subnet mask to the following interface.
Iface pdr if0 dix 1500 5 0x60	Creates a standard Ethernet connection, type pdr (packet driver), interface name if0, type dix, MTU 1500, Buffer Limit 5, Interrupt vector of the packet driver at 0x60.
route add default if0 196.0.0.1	Set the default route for packets travelling to and from if0 to 196.0.0.1
domain server 196.0.0.1	Set the domain name server to 196.0.0.1 This server is used to convert names to IP addresses.
ip address	Cause SOCKETS to display IP status
# set TCP parameters	
tcp window 2920	Set the windows size to 2920 bytes

tcp retry 6	Set the retry count to 6
tcp irtt 500ms	Set the Initial Round Trip Time to 500ms
tcp mss 1460	Set the Maximum Segment Size to 1460 bytes

Example 2: Serial Connection – SOCKETS Dial-up to ISP

SOCKETM is loaded from the command line as follows:

SOCKETM.EXE EXAMPLE2.CFG

The configuration file EXAMPLE2.CFG contains:

interface asy p0 ppp 576 10 0x3f8 4 19200 modem.mc2	Creates an asynchronous ppp connection on COM1 IRQ4 named p0 with an MTU of 576 and buffer limit of 10. Uses the file modem.mc2 for modem configuration information.
route add default p0	Route all packets through interface p0
ip ttl 64	Set time to live for packets at 64 “hops”
tcp mss 1460	Set Maximum Segment Size to 1460 bytes
tcp window 2920	Set Windows Size to 2920 bytes
par p0 ipcp local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par p0 ipcp local address 0.0.0.0	Server assigned IP address
par p0 lcp local accm 0	Asynch control character map set all bits to zero.
par p0 lcp local acfc on	Address control field compression on or off.
par p0 lcp local pfc on	Protocol field compression on or off.
par p0 lcp local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same then there is a possible loop back, repeat test.
par p0 pap user test example	Set the user name to “test” and password to “example”
par p0 ipcp open par p0 lcp open	Open specified layer. ipcp = ip control protocol. Lcp = link control protocol. When an immediate dial operation is required the "par if0 lcp start" command should be used. When dial-on-demand is desired the “par if0 lcp open" command should be used and when connect-on-received-call is desired, the "par if0 lcp listen" command should be used. The start

	command implies the open command and the open and listen commands may both be used. Dial-on-demand can also be disabled by the "p n" modem configuration file parameter and by an API call. Dial-on-demand can be enabled by an API call.

MODEM.MC2

i A@w100atdt^M^J@w100	Initialise modem
d ^M^J@w2000ATDT@n^M^J@d40000	Dialling string
n 123-4567	Number to dial
r 3	Number of retries
p rx	Enable debugging output to screen

Example 3: Single Dial-in Connection

Allow only single users to dial in and issue each with an IP address on the fly. Setup **asy** interfaces, each with its own IP address, COM port, modem and telephone number. In the answer script, a password may be asked (no need for XID: does it in the script), and on success an IP address is sent in dotted decimal form. (Should you want to use different passwords, an **mdd/aslink** setup as described in Example 2 may be used, but then every user will have his own IP address fixed to the XID.)

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a “PPP server” and a “PPP client” without having to re-configure it.

The configuration file EXAMPLE3.CFG contains interface configurations for all modem ports as well as other connections (like Ethernet) that might be used. An **asy** interface could be:

IPAddress=192.6.3.1/30	Set the IP Address of the following interface to 192.6.3.1 with a subnet mask set to 30 bits.
iface asy sl0 cslip 576 10 0x3F8 4 19200 modem.mc3	An asy modem connection on COM1 connecting to the smallest subnet allowing 2 hosts.

The modem definition file is MODEM.MC3:

i a@w100atz^M^J@w500ats0=1^M^J@ w100	Initialise modem (consult the manual for your own modem initialisation string)
x 192.6.3.2	Specify IP address (in the XID variable to make the answer scripts more uniform).
a @w1000^M^JPassword? @r9000Sockets@@w200^M^JYour address: @x ^M^J@r1000GOTIP@	Answer script to prompt remote for logon: Wait 1 second, send "<CR><LF>" to get cursor on a new line, send "Password? " and wait 9 seconds to receive "Sockets" somewhere in the data stream # (the connection will break if failed), wait 200 milliseconds and send the IP address with @x on a new line. Wait 9 seconds to receive "GOTIP" as confirmation.
p rx	Parameters for debugging (show modem data): r=receive and/or x=xmit

Example 4: Single Dial-in Connection with ASY Interface

A user who dials into the system in Example 3 which supplies the IP address for the user, has to use an **asy** interface to his modem. The user must specify the **@a** address command in the connect script in the modem file. The **@a** ***time*** command waits for ***time*** milliseconds to see the dotted decimal form of an IP address. It assigns this address to the **asy** interface. The user should have a default route to this **asy** interface to be able to see the whole world through it, or just a specific route for what he wants to see. The configuration file SOCKET4.CFG should contain at least the **asy** interface configuration similar to the previous examples.

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a “PPP server” and a “PPP client” without having to re-configure it.

The modem definition file is MODEM.MC4:

i a@w100atz^M^J@w500ats0=0^M^J@ w100	Initialise the modem (consult the manual for your own modem initialisation string).
d ^M^J@w2000atdt@n^M^J@d40000	Dial command
n 0800123456	Number to dial

r 5	# Number of retries
c @r7000sword@Sockets^M^J@a1000G OTIP	Connect script to login at the remote: wait 7 seconds after DCD to receive password prompt, send "Sockets" as password, wait 1 second for IP address, send "GOTIP" as confirmation.
p rx	Parameters for debugging (show modem data): R=receive and/or x=xmit

Example 5: Direct Serial Connection with SOCKETS as a Server

This section explains how to configure SOCKETS as a server to listen on the designated serial port and wait for a valid connection and use standard dial up networking to connect.

The Client Connection

There are two methods of connection available - direct serial connection or dial in on a standard phone line. The Client here can be any Win95, Win98, or WinNT system.

For a direct serial connection to a Windows environment earlier than Windows 2000 and XP, a modem driver must be installed. Such a driver does not ship standard with SOCKETS but can be found through Internet searches. The client must then create a dial up networking connection with the phone number of CLIEN1, no username or password.

Configuring SOCKETS

Configuration of the SOCKETS software is handled within two files, namely EXAMPLE5.CFG and MODEM.MC5. SOCKETS can be loaded by means of a batch file that contains the following commands:

SOCKETM EXAMPLE5.CFG

These commands allow SOCKETS to allocate more memory, than allowed by the default values, when initiating a TCP/IP connection over a serial link. SOCKETS processes the EXAMPLE5.CFG file followed by the MODEM.MC5 file.

SOCKETS Configuration File Details

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a “PPP server” and a “PPP client” without having to re-configure it.

EXAMPLE5.CFG contains:

iface asy if0 ppp 576 5 0x2f8 3 19200 modem.mc5	Creates an asynchronous connection on com 2, IRQ 3 with a Baud rate of 19200, MTU of 576, and a Buffer Limit of 5. Access the modem.mc5 file for specific initialization strings.
User SocketsUser SocketsPassword 196.10.229.18	For user connecting with name "SocketsUser" and Password "SocketsPassword" assign the ip address of 196.10.229.18
par if0 ipcpin local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par if0 ipcpin local address 196.10.229.2	
par if0 ipcp local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par if0 ipcp local address 196.10.229.4	
par if0 lcpin local accm 0	Asynch control character map, set all bits to zero.
par if0 lcpin local acfc on	Address control field compression on or off.
par if0 lcpin local pfc on	Protocol field compression on or off.
par if0 lcpin local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, and then there is a possible loop back, repeat test.
par if0 lcpin local authen pap	Set local authentication to pap
par if0 lcp local accm 0	Asynch control character map set all bits to zero.
par if0 lcp local acfc on	Address control field compression on or off.
par if0 lcp local pfc on	Protocol field compression on or off.
par if0 lcp local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, then there is a possible loop back, repeat test.
Par if0 ipcp open Par if0 ipcpin open	Open specified layer. ipcp = ip control protocol.

par if0 lcp listen par if0 lcpin listen	Lcp = link control protocol. When an immediate dial operation is required the "par if0 lcp start" command should be used. When dial-on-demand is desired the “par if0 lcp open" command should be used and when connect-on-received-call is desired, the "par if0 lcp listen" command should be used. The start command implies the open command and the open and listen commands may both be used. Dial-on-demand can also be disabled by the "p n" modem configuration file parameter and by an API call. Dial-on-demand can be enabled by an API call.
route add default if0	Route all packets through interface if0
ip address route	Prints out the systems ip address and route. Useful for debugging only.

MODEM.MC5

	Initialize Modem. For a direct serial connection no initialization string is necessary.
a @r20000CLIEN1@CLIENTSERVER	When Sockets receives the string “Clien1” send the response “ClientServer”
r 3	Number of Retries
p rx	Debugging information parameters: r=show modem receive, x=show modem xmit d=always dial, n=no dial-on-demand

Example 6: Direct Serial Connection with SOCKETS as a Client

Setting the Server

The NT server must have Remote Access Services enabled, commonly referred to as RAS, as well as the "Direct Serial cable between two PCs " modem driver installed on the proper COM port. The following example also connects using DHCP. If this feature is to be used then DHCP services must also be setup on the NT server. Other options would include the use of static IP addressing or BOOTP. Please review the cabling requirements from the WinNT documentation or help files. Standard cables often will not work with direct connections due to the cabling demands of WinNT.

Configuring the Software

Configuration of the SOCKETS software is handled within two files, namely EXAMPLE6.CFG and MODEM.MC4. SOCKETS can be loaded by means of a batch file that contains the following commands:

SOCKETM EXAMPLE6.CFG

These commands allow SOCKETS to allocate more memory than allowed by the default values when initiating a TCP/IP connection over a serial link. SOCKETS processes the ECAMPLE6.CFG file followed by the MODEM.MC6 file.

Configuration File Details

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a "PPP server" and a "PPP client" without having to re-configure it.

`EXAMPLE6.CFG:`

Iface asy if0 ppp 1500 30 0x2f8 3 19200 modem.mc6	Creates an asynchronous connection on com 2, IRQ 3 with a baud rate of 19200 and access the modem.cfg file for specific initialization strings.
par if0 ipcp local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par if0 ipcp local address 0.0.0.0	The ip address 0.0.0.0 indicates that the server must assign the client a valid ip address
par if0 lcp local accm 0	Asynch control character map, set all bits to zero.
par if0 lcp local acfc on	Address control field compression on or off.
par if0 lcp local pfc on	Protocol field compression on or off.
par if0 lcp local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, then there is a possible loop back, repeat test

par if0 pap user id password	Replace "id" and "password" with a valid username and password on the NT server that you are connecting to.
par if0 ipcp open par if0 lcp open	Open specified layer. ipcp = ip control protocol. lcp = link control protocol.
route add default if0	Route all packets to interface if0
ip address route	Prints to the screen the systems ip address and route, useful for debugging only.

MODEM.MC6

i CLIENT@r5000CLIENTSERVER@ @a2000	Initialize Modem and connect as client
r 3 p rx	Number of Retries Debugging parameters r display what we receive x display what we transmit

Example 7: SOCKETS Machine Using Call Back Verification.

Scenario:

If the NT machine logs into the SOCKETS machine with SocketsUser1 / SocketsPassword1, the NT machine is assigned IP address 196.10.229.18 and the SOCKETS machine is 196.10.229.2.

If the NT machine logs into the SOCKETS machine with "SocketsUser / SocketsPassword," the SOCKETS machine will break the connection and dial back to 08036501 logging in as "NtUser" with password "NtPassword." The NT machine assigns the IP addresses of both machines.

The SOCKETS machine never initiates a modem call unless it has been called first. Once SOCKETM is running, the IOCTL program can be used to initiate a dial operation or to enable dial on demand.

SOCKETS Configuration File Details

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a "PPP server" and a "PPP client" without having to re-configure it.

EXAMPLE7.CFG

iface asy p ppp 1500 30 0x3f8 4 9600 modem.mc7	Creates an asynchronous connection designated interface “p” type ppp on COM1 IRQ4 with an MTU of 1500, Buffer limit of 30, baud rate 9600 and modem information contained within the modem.mc7 file
route add default p	Routes all packets through interface “p”
user SocketsUser SocketsPassword 196.10.229.18 cbv	If user is SocketsUser with password SocketsPassword assign IP address of 196.10.229.18 then disconnect session and call back.
user SocketsUser1 SocketsPassword1 196.10.229.18	If user is SocketsUser1 with password SocketsPassword1 assign IP address of 196.10.229.18 and continue session.
par p ipcpin local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par p ipcpin local address 196.10.229.2	Assign local IP address 196.10.229.2
par p ipcp local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par p ipcp local address 0.0.0.0	The ip address 0.0.0.0 indicates that the server must assign the client a valid ip address.
par p lcpin local accm 0	Sets the Asynch Control Character Map to 0.
par p lcpin local acfc on	Sets local Address and Control Field Compression on.
par p lcpin local pfc on	Sets local Protocol Field Compression on.
par p lcpin local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, then there is a possible loop back: repeat test
par p lcpin local authen pap	Sets the local Authentication protocol to pap.
par p lcp local accm 0	Sets the local Asynch Control Character Map to 0.
par p lcp local acfc on	Sets the local Address and Control Field Compression to on.
par p lcp local pfc on	Sets the local Protocol Field Compression

	to on.
par p lcp local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, then there is a possible loop back, repeat test. .
par p pap user NtUser NtPassword	Allow login for user NtUser with password NtPassword. PAP corresponds with the previous set authentication protocol.
par p ipcp open	Set incoming dial-in method to open.
par p ipcpin open	Set incoming dial-in method to open.
par p lcp listen	Set dial-out method to listen.
par p lcpin listen	Set dial-out method to listen.

MODEM.MC7

i a@w500a@w500atl1w1%e2&q5&c1&d2s11=70&k3s30=18s0=0^M^J@w100	Modem Initialization string. Please refer to the modem manufacturer manual for the specific initialization string to match your modem.
a	
n 08036501	Number to dial
d ^M^J@w1000atd@w110@n@w110^M@d40000	Dial command
c	
r 4	Number of retries to dial the connection.
p n	Debugging parameters: r=show modem receive, x=show modem xmit d=always dial, n=no dial-on-demand

Example 8: SOCKETS Machine with CBV and Logging-in.

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a “PPP server” and a “PPP client” without having to re-configure it.

EXAMPLE8.CFG

iface asy p ppp 1500 30 0x3f8 4 9600 modem.mc8	Creates an asynchronous connection designated interface “p” type ppp on COM1 IRQ4 with an MTU of 1500, Buffer limit of 30, baud rate 9600 and modem information contained within the modem.mc8 file
route add default p	Routes all packets through interface “p”
user NtUser NtPassword 196.10.229.208	If user is NtUser with password NtPassword assign IP address of 196.10.229.208 then disconnect session
par p ipcp local compress tcp 16 1	Enables header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par p ipcp local address 0.0.0.0	The ip address 0.0.0.0 indicates that the server must assign the client a valid ip address.
par p lcp local accm 0	Sets the local Asynch Control Character Map to 0.
par p lcp local acfc on	Sets the local Address and Control Field Compression to on.
par p lcp local pfc on	Sets the local Protocol Field Compression to on.
par p lcp local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, then there is a possible loop back, repeat test.
par p pap user SockectsUser SocketsPassword	Allow login for user SocketsUser with password SocketsPassword. PAP corresponds with the previous set authentication protocol.
par p ipcp open	Set incoming dial-in method to open.
par p lcp open	Set incoming dial-in method to open.
par p ipcpin local compress tcp 16 1	Enables incoming header compression, where 16 are the maximum number of concurrent TCP/IP connections. 1 turns on compression, 0 turns off compression.
par p ipcpin local address 196.10.229.202	Set the local IP address on an incoming transmission to 196.10.229.202
par p lcpin local accm 0	Sets the local Asynch Control Character Map to 0.
par p lcpin local acfc on	Sets the local Address and Control Field Compression to on.
par p lcpin local pfc on	Sets the local Protocol Field Compression

	to on.
par p lcpin local magic on	Magic number option on or off. The magic number is used to detect loop back links by creating a number, sending a configure request, then comparing the number received. If it is the same, then there is a possible loop back: repeat test
par p lcpin local authen pap	Set the authentication protocol for incoming lcpin to pap.
par p ipcpin open	Set dial-in method for ipcpin to open.
par p lcpin open	Set dial-in method for lcpin to open

MODEM.MC8:

I a@w500a@w500atl1w1%e2&q5 &c1&d2s11=70&k3s30=18s0=0^ M^J@w100	Initialize the modem; please refer to the manufacturer documentation for the specific modem initialization string.
a	
n 08034131	Number to dial
d ^M^J@w1000atd@w110@n@w1 10^M@d40000	Dial string.
c	
r 4	Number of retries.
p r	Debugging information. Parameters: r=show modem receive, x=show modem xmit d=always dial, n=no dial-on-demand

When the "NT look-alike" side starts up, it dials 08034131. The "SOCKETS" side answers and after the successful login, drops the connection and dials 08036501. During PPP negotiation, the "NT look-alike" side is assigned IP address 196.10.229.202 and the "SOCKETS" side, IP address 196.10.229.108.

Example 9: Dial-up SLIP Connection with SOCKETS as an IP Router

You want to connect your LAN to another network via a modem using a dial-up SLIP link. The SOCKETS PC will act as an IP router (or gateway) to the other network. This example is symmetrical: You can use the same setup on both sides to enable any side to initiate the call. (The IP addresses will have to be unique.)

Use an **asy** interface with CSLIP to get better throughput. Your network is 192.6.1.0 and your address 192.6.1.111. The **asy** interface will also be 192.6.1.111 linking the 192.6.2.0 network (or

the rest of the world) on the other side. The modems establish a connection with no logon required.

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP parameters is to allow the SOCKETS implementation to act as both a "PPP server" and a "PPP client" without having to re-configure it.

The configuration file EXAMPLE9.CFG contains:

Ip address 196.6.1.111/24	Sets an IP address of 196.6.1.111 with a 24-bit subnet mask to the following interface.
Iface pdr if0 dix 1500 10 0x60	Creates a standard Ethernet connection, type pdr (packet driver), interface name if0, type dix, MTU 1500, Buffer Limit 10, Interrupt vector of the packet driver at 0x60.
IPAddress=192.6.1.111/0	Sets an IP address of 192.6.1.111 with a 0-bit subnet mask to the following interface.
Iface asy sl0 cslip 576 10 3f8 4 19200 asy-io.mod	Creates a standard modem connection on COM1. The connection is asynchronous, interface name sl0, MTU 576, Buffer Limit 4, baud rate 19200, and reference the file asy-io.mod for specific modem information.
; Make this the default route:	
par sl0 19200 CTS RTS	For interface sl0 set the serial baud rate to 19200, output flow to CTS, input flow to RTS. CTS = Clear to Send modem signal. RTS = Request To Send modem signal. *Use only for asy type interfaces.
par sl0 ripadv	Enable Routing Information Protocol on interface sl0.
rip advertise 30	Set RIP advertise time to 30. Time is the number of elapsed seconds before the advertisement is repeated.
rip use 200	Set RIP use time to 200. Time is the period during which routes are added or amended as a result of RIP, and are valid for time seconds.

The start up file SOCKETS.STU will display the current status with:

ip address	Display the IP address
route	Display the routes
ifstat	Display the interfaces

The modem definition file is ASY-IO.MOD:

I a@w100atz^M^J@w500ats0=1^M ^J@w100	Initialise modem (Caution: consult the manual for your own modem)
d ^M^J@w2000atdt@n^M^J@d400 00	Dial command: send "<CR><LF>", wait 2 seconds, send "atdt<number><CR><LF>", wait 40 seconds for DCD
n 0,011-790-1234	The number to dial
r 5	Number of retries
p r	Parameters for debugging (show modem data): r=receive and/or x=xmit
	Password protected logon facilities can be added with answer and connect scripts. (See next examples or ASY-IOL.MOD on disk)

Example 10: Multiple Dial-in Connections

You have a number of modems for dial-in of various users or other networks each with a fixed IP address. When somebody dials into your system, SOCKETS will need to know his IP address to be able to set up a return route to him. The network size for each remote host must also be known. (You have to understand sub-networks for this example.)

The way to do this is to set up a **mdd** interface for each IP address (using an IP address on that network). Each **mdd** interface has a modem definition file containing a unique exchange identifier (XID). Each modem has an **aslink** interface with a modem file containing an answer script. When the remote dials in, he has to specify his XID in his connect script (like a login). The **aslink** then links to the **mdd** with the same XID and your remote user is connected using the routes set for his **mdd** interface.

PPP Parameters:

Ipcp = ip control protocol.
Lcp = link control protocol.

The commands **lcpin, papin, apin** and **ipcpin** can be specified for incoming parameters. These correspond with the **lcp, pap, ap** and **ipcp** commands. The reason for having a different set of PPP

parameters is to allow the SOCKETS implementation to act as both a “PPP server” and a “PPP client” without having to re-configure it.

The configuration file EXAMPL10.CFG should contain:

IPAddress=197.55.2.9	Set the IP address of the following interface to 197.55.2.9
iface pdr if0 dix 1500 10 0x60	Creates a standard Ethernet connection, type pdr (packet driver), interface name if0, type dix, MTU 1500, Buffer Limit 10, Interrupt vector of the packet driver at 0x60.
; A Multi Destination Driver	
; connecting to the smallest subnet allowing 2 hosts	
IPAddress=193.101.51.1/30	Set the IP address of the following interface to 193.101.51.1 with a 30-bit subnet mask.
iface mdd mdd0 slip 576 10 mdd10.mod	Create a multiple destination interface, type mdd, interface name mdd0, class slip, MTU 576, Buffer Limit 10, access the file mdd10.mod for specific interface commands.
iface asy as10 cslip 576 10 0x3F8 4 19200 aslink.mod	Create an aslink connection on COM1.

All the modems (**aslink** interfaces) may use the ASLINK.MOD file:

i a@w100atz^M^J@w500ats0=1^ M^J@w100	Initialise modem (Warning: consult the manual for your specific modem initialisation string)
a @w500^M^JXID?@f5000@w20 0ccc	Answer script to prompt for XID
p r	Parameters for debugging (show modem data): r=receive and/or x=xmit

All the **mdd** interfaces will use a specific MDD*n*.MOD file with its own unique XID. The XID links to the IP address in the configuration of the **mdd** interface. MDD0.MOD will be:

x id0	Set the XID variable
p r	Parameters for debugging (show modem data): r=receive and/or x=xmit

The users dialling into the system above may use **asy** interfaces with a modem file containing the following commands (see file ASY-OX.MOD):

i a@w100atz^M^J@w500ats0=1^M ^J@w100	Initialise modem (Warning: consult the manual for your own modem)
d ^M^J@w2000atdt@n^M^J@d400 00	Dial command: send "<CR><LF>" wait 2 seconds, send "atdt<number><CR><LF>" wait 40 seconds for DCD.
n 790-1234	The number to dial
r 5	Number of retries
x id0	Set the XID variable
c @r1000XID@^F@x^M@r100c	Connect script to login at the remote: wait 1 second after DCD to receive XID prompt, send the ^F XID ^M sequence, receive a "c" as confirmation.
p rx	Parameters for debugging (show modem data): r=receive and/or x=xmit

Chapter 14, SOCKETS Utility Descriptions

SOCKETS Utilities

SOCKETS utilities make use of command-line parameters and/or configuration files. Please be careful to note the name and location of the configuration file used by the application you are working with. All SOCKETS applications require that the kernel be loaded before the application is run in order to function properly.

ARPSTAT

ARPSTAT is a demonstration program to illustrate the use of the ArpApi function. It displays the status of the ARP cache and can also be used to remove ARP entries. It is hard coded to only remove Ethernet entries.

Syntax

ARPSTAT [*ip address1*] [*ip address2*] [...] [*ip addressN*]

Remarks

ip addressN

The IP address of an ARP entry to be removed. If this is 0.0.0.0 then all entries will be removed.

Example

```
ARPSTAT 198.162.1.1
```

Removes the ARP entry associated with the IP address of 198.162.1.1 and displays the status of the remaining entries.

CAPIDIAG

This is a diagnostic program for the SOCKETS TCP/IP Basic interface. It tests the API as well as the stack and even the network when external servers are specified. It also measures the performance of the network for TCP and UDP traffic. The external server(s) need to run both TCP and UDP echo servers on TCP port 7 and UDP port 7. A Sockets machine can be used as a server by running SUPERD. The source code for CAPIDIAG is supplied as an advanced example of using the Basic API (CAPI).

Syntax

CAPIDIAG [/b=*bulk_test_seconds*] [/d] [/f=*fail_action*] [/n] [/t=*timeout_seconds*] [/v=*verbosity level*] [server1] [server2] [...] [serverN]

Options

The /b option allows the testing time for each traffic test to be set.

The /d option specifies debugging of the server.

The /f option specifies the fail action. Valid values for this option are:

0 print error and continue
1 print error and wait for Esc.
2 print error and exit

The /t option sets the number of timeout seconds.

The /n option specifies that the local loop back traffic tests should be skipped

The /v option sets the level of verbosity. Valid values for this option are:

0 only print errors
1 print names of all tests
2 print additional information on errors
4 print summary of events
8 print kernel configuration
16 print buffer for bulk read back failure
32 print NET_ADDR
64 print Read values

Example

```
CAPIDIAG /f=2 server1 server2
```

This will run the tests to a local built-in echo server and to server1 and server2. It will exit the program on a failure.

DHCPSTAT

DHCPSTAT displays the DHCP information for the machine.

Syntax

DHCPSTAT [r | v]

Options

The r option is for forcing a renewal of the DHCP lease.

The v option displays the SOCKETS version information.

Example

```
DHCPSTAT
```

This will display all the DHCP information, such as IP address and lease time.

FTP

FTP is a file transmitting and retrieving client that runs in interactive or batch mode.

Syntax

FTP server [options]

Options

/n

/v

/p=Port

/f=ScriptFile [ScriptParameters]

Remarks

Server
The name or ip address of a server to connect to.

/n
Suppress progress indicator.

/v
Verbose output for troubleshooting.

/p=Port
Connect to a server port other than the standard FTP port number of 21.

/f=ScriptFile
A file containing commands for the client to send to the server upon connection. Simple parameter substitution is performed, with the first element of *ScriptParameters* accessible as "%1," etc.

ScriptParameters
Parameters to pass into the *ScriptFile*.

Return Codes

0	Success
1	Parameter error
2	SOCKETS not loaded
3	User aborted
4	Transfer aborted
5	Error writing local file
6	Error reading local file
Other	Server returned error response code; to find that error code, add 390 to the response code returned by FTP. The result will always be greater than or equal to 400 in this case.

Example

```
FTP /n FTP.cdrom.com /f=getfile.scr /.2/simtelnet/msdos DIRS.TXT

(The file GETFILE.SCR):
user anonymous
pass root@
cd %1
binary
get %2
```

```
quit
```

FTP Commands

The commands entered at the FTP client can be interpreted and translated to standard FTP commands to be sent to the server. The FTP server might recognise more, or less, commands than the standard list of commands as specified in RFC 959. The **site** command is always server dependent. Some of the standard commands are implemented differently in various servers.

Useful things to note are:

1. The **put** and **get** commands allow multiple file transfers by usage of wild card characters. When **get**ting files with paths or long names, no translation of foreign file names are done. Specify a valid DOS ***local_file*** name.
2. A short directory list (NLST) is obtained by **ls** and the long list with **dir**.
3. Some of the commands can be abbreviated.
4. Some commands are aliases added for user comfort like **bye**, **exit** and **quit**; **get** and **mget**; and **put** and **mput**.
5. The optional **[*local_file*]** parameter will, when specified, cause the output of that command to be logged to a file. By specifying the file as PRN you can get immediate printouts.
6. On some servers you might specify the optional **[*remote_file*]** parameter as PRN or the printer output device to do remote printing. (See also the **site nopath** command for the SOCKETS FTP server.)
7. The **F3** key and **spacebar** can be used to recall the last command word by word.

Below is a list of commands recognised by the SOCKETS FTP client (some FTP servers might not offer all the facilities):

Command	Description
abort	Cancel an incomplete transfer
append	"Put" a file at the server but append it if the file exists
ascii	Synonym for type a
binary	Synonym for type i
bye	Synonym for quit
cd directory	Synonym for cwd
cwd directory	Change server directory
dele file	Delete a server file
dir [file l directory [local_file]]	Synonym for list
exit	Synonym for quit
get remote_file(s) [local_file]	Transfer a file from the server in the current mode (type)
image	Synonym for type i
ls [file l directory [local_file]]	Synonym for nlst

lcd directory	Perform a local change directory
ldir [file l directory]	Give a local directory listing
list [file l directory [local_file]]	Give a long directory listing
mget remote_file(s) [local_file]	Synonym for get
mkdir remote_directory	Create a server directory
mput local_file(s) [remote_file]	Synonym for put
nlst [file l directory [local_file]]	Give a short names-only directory listing
pass [password]	Password for username
pasv [on | off]	Report or change the status of the passive transfer mode to enable firewall friendly file transfers. (The SOCKETS FTP client always tries to switch passive mode on at the start of a session.)
put local_file(s) [remote_file]	Transfer a file to the server in the current mode (type)
Pwd	Print working directory at server
quit	Terminate FTP session
quote remote_command [args ...]	Send a command to the server without any interpretation
rmdir remote_directory	Remove (delete) a server directory
rnfr existing_filename	Rename a file, command 1 of 2
rnto new_filename	Rename a file, command 2 of 2
site sub-command	Send server specific commands
size file	Report the file size in bytes as a 213 message
shell	Shell to DOS for IFTP.EXE
stat	Report the status of a transfer or active connections
System	Return operating system information from the server
type [i I a]	Report or select the file transfer mode: image (binary) or ASCII
user [username]	Username to logon
verbose [on | off]	Verbose mode reports more of the FTP negotiations

FTPAPI

FTPAPI is both a server and client for the FTP protocol that loads as a TSR. It should be called directly from your application. The documentation for this interface is found in FTPAPI.H. A complete "server and multiple client" sample program is provided as FTPTEST.C and FTPTEST.EXE.

Syntax

FTPAPI [options] [Port]

Options

/m=MemorySize

/c

/s

/u

/v=disable passive mode

Remarks

/m=MemorySize

The number of bytes of memory available to the server. This value defaults to 32768.

/c

Running **FTPAPI** again with this option disables the TSR's listen socket.

/s

Running **FTPAPI** again with this option displays the TSR's status.

/u

Running **FTPAPI** again with this option unloads the TSR.

[Port]

FTPAPI listens on the listed port. This parameter defaults to the standard FTP port number of 21.

Configuration File

FTPAPI uses the standard SOCKETS password file, SOCKET.UPW, for validating logins. See **FTPD** for more information.

Example

```
FTPAPI /m=40000 42
```

GETMAIL

GETMAIL retrieves all of the messages from a POP3 (Post Office Protocol version 3) Internet mail server. Each message is stored as an individual file on the local machine. *GETMAIL* also creates a log file to indicate successful downloads or errors.

Syntax

GETMAIL server user password

Options

Server

The IP address or DNS name of the Internet mail server from which to download messages. The messages that are downloaded are named by sequential file number and are placed in the current working directory.

User

The username for server identification purposes.

Password
The secret for account authentication on the server.

Logging Format

Timestamp, Code String

Timestamp
Weekday Month Day Time Year

Code
Three digit integer. 000 means perfect success, 100-199 mean usage error and 200-299 means TCP/IP error from server.

String
Human–readable explanation of the error code.

Example

```
GETMAIL 10.0.0.1
GETMAIL 10.0.0.1 guest secret
```

HTTPGET, WHTTPGET and W9HTTPGET

HTTPGET is a DOS HTTP (web) client that can retrieve the contents of a URL to a local file. **WHTTPGET** is a Windows NT, 2000, XP console mode program with the same functionality as **HTTPGET**. **W9HTTPGET** is the Windows 9x counterpart and is not enabled for IPv6 operation.

Syntax

HTTPGET [-p=*Port*] [–s=*Server*] [–v] [-a=*Username*:*Password*] *URL* [*local-file*]

WHTTPGET [-p=*Port*] [–s=*Server*] [–v] [-a=*Username*:*Password*] *URL* [*local-file*]

W9HTTPGET [-p=*Port*] [–s=*Server*] [–v] [-a=*Username*:*Password*] *URL* [*local-file*]

Options

-v
Display extra output for troubleshooting.

Remarks

Port
Use to specify a remote port other than the default of 80 to connect to.

Server
Use to specify a server name if the URL doesn't contain one.

URL
The URL to retrieve from. The notation http:// is optional and may be left out.

Username:Password

The username and password to use if the request must be authenticated.localfile
Rather than keeping the filename from the URL, the contents may be saved to *localfile*.

Example

```
HTTPGET http://www.datalight.com/images/logohead.gif
WHTTPGET -v http://www.datalight.com/images/logohead.gif logo.gif
```

HTTPPUT, WHTTPPUT and W9HTTPPUT

HTTPPUT is a DOS HTTP (web) client that can upload the contents a local file to a URL. **WHTTPPUT** is a Windows NT, 2000, XP console mode program with the same functionality as **HTTPPUT**. **W9HTTPPUT** is the Windows 9x counterpart and is not enabled for IPv6 operation. The target server must support the PUT method like HTTPD does.

Syntax

HTTPPUT [-p=*Port*] [–s=*Server*] [–v] [-a=*Username*:*Password*] *URL* [*local-file*]

WHTTPPUT [-p=*Port*] [–s=*Server*] [–v] [-a=*Username*:*Password*] *URL* [*local-file*]

W9HTTPPUT [-p=*Port*] [–s=*Server*] [–v] [-a=*Username*:*Password*] *URL* [*local-file*]

Options

-v

Display extra output for troubleshooting.

Remarks

Port

Use to specify a remote port other than the default of 80 to connect to.

Server

Use to specify a server name if the URL doesn't contain one.

URL

The URL to upload to. The notation http:// is optional and may be left out.

Username:Password

The username and password to use if the request must be authenticated

.localfile

Rather than keeping the filename from the URL, the contents may be saved to *localfile*.

Example

```
HTTPPUT -a=peter:baskaron www.datalight.com/images/logohead.gif
WHTTPGET -v http://www.datalight.com/images/logohead.gif logo.gif
```

IFSTAT

IFSTAT displays the status of the Interface, Modem, Serial, PPP, and it displays the version information for SOCKETS.

Syntax

IFSTAT [/r=c|*msec*] [f][i][m][p][s][t][v]

Options

/r=c – repeat the display on significant changes until a key is pressed.

/r=*msec* – repeat the display every *msec* milliseconds until a key is pressed.

f - show full MIB II statistics. Sockets must be built to gather MIB II statistics.

i - show the Interface status.

m - show the Modem status.

p - show the PPP status.

s - show the Serial status.

t - show the current time.

v - show the version information.

Example

```
IFSTAT v
```

This will display the SOCKETS version information

Notes

The timestamp and repeat options are intended to provide better diagnostics for modem and PPP connections.

The changes that will cause a new printout depend on the options that are selected as follows:

Option	Sigificant changes
s	Connected status.
m	Dial state, Timer state, Disconnecting flag and "XID acked" flag.
p	PPP phase, Incoming/Outgoing, Callback, LCP, AP, IPCP and IPV6CP states.

In order to log all the state changes if dialling is automatically started when Sockets is loaded, it is recommended to put both the Sockets load and the IFSTAT command in a batch file e.g:

```
socketm
ifstat /r=c tsmp >sockets.log
```

If the IFSTAT command is manually executed, the modem dialling and PPP negotiations may already have succeeded or failed by the time IFSTAT is invoked.

IOCTL

IOCTL is a diagnostic utility for the SOCKETS IOCTL functions using the TCP/IP Basic API

Syntax

IOCTL *interface name*

Remarks

interface name The name of the interface to be tested.

Example

```
IOCTL if0
```

Tests the IOCTL functions through the interface "if0" based on the commands given during the diagnostics.

IOCTLH

IOCTLH is a diagnostic utility for the SOCKETS IOCTL functions using the TCP/IP Basic API. This version supports the hot-swappable functionality.

Syntax

IOCTLH *interface name*

Remarks

interface name The name of the interface to be tested.

Example

```
IOCTLH if0
```

Tests the IOCTL functions through the interface "if0" based on the commands given during the diagnostics.

IPSTAT

The IPSTAT utility returns statistics on IP and memory. Use IPSTAT to check for error conditions and memory problems.

Syntax

ipstat [/2] [/a] [/c] [/m] [/s] [*message*]

/2 show MIB-2 counters

/a show memory allocation

/c clear memory allocation list

/m show memory statistics

/s show number of sockets

message show message

Example

```
IPSTAT %TIME%
```

The following will be displayed (The values may differ):

Datalight Sockets IPSTAT v6.22 (Revision 4.20.1560)

Copyright (c) 1989-2005 Datalight, Inc.

Portions copyright (c) GPvNO 2004-2005

```
Sockets build 1565
17:30:04.49
Kernel supports IPv4
IPv4 address 192.168.0.53  IPv4 Subnet mask: 255.255.255.0
IPv4 Routing table:
Destination    Class   Interface   Gateway         Metric  RIP time/flags
Default                if0         192.168.0.200   1       Static
Default                if0         192.168.0.200   1       Static
192.168.0.0    Net C   if0                         1       Static
192.168.0.0    Net C   if0                         1       Static
IP stats at 14DF:02C4:
Total packets                      36
Smaller than minimum size          0
IP header length too small         0
Wrong IP version                   0
IP header checksum errors          0
Unsupported protocol               0
```

LPR

LPR is a printer client for UNIX-style printer servers. An **LPD** server can be configured for SOCKETS.

Syntax

LPR /s=Server /p=Printer /u=Agent Filename

Options

/r

/q

/l=Port

/h=LocalHostName

/c=JobClass

/j=JobName

/n

/t

Remarks

/q

Query Mode. Can be followed by agent names or job numbers to filter output.

/r

Remove Mode. May be followed by job numbers to specify jobs to remove.

/s=Server
Hostname of the print server.

/p=Printer
Name of the printer device on the server to be used for output.

/u=Agent
User name on the server. Used for identification.

Filename
Local file name to spool to the server.

/l=Port
Connect to the specified port on the server rather than the standard port number of 515.

/h=LocalHostName
Name of the local host for job identification purposes.

/c=JobClass
Name of the job class for job identification and scheduling purposes.

/j=JobName
Name of the job, for identification purposes; defaults to the local file name if not specified.

/n
Run without user interaction.

/t
Text filter. Strips all unprintable characters before printing.

Example

```
LPR /n /s=10.0.0.1 /p=prn0 /u=Tester output.dat
LPR /n /s=10.0.0.1 /p=prn0 /u=Tester /q
LPR /n /s=10.0.0.1 /p=prn0 /u=Tester /r
```

MAKEMAIL

MAKEMAIL packages the body text and any attachments for delivery using the **SENDMAIL** application.

Syntax

MAKEMAIL –nScriptFile –tToAddress –fFromAddress –sSubject –bBodyTextFile -oOutputFile-aAttachment

Options

ScriptFile
The name of a file that contains all of the information needed to create the mail file. Each new command line argument in the script file must be on a separate line. Multiple *ToAddress* and *Attachment* lines may be specified.

ToAddress
The e-mail address of the recipient(s) of this mail. Additional recipients are specified by repeated use of the **–t** parameter. If the *ToAddress* is a name that can be resolved by either the DNS server or host file then the *@servername* is not necessary.

FromAddress
Used to identify the sender of the message.

Subject
The subject line of the e-mail message.

BodyTextFile
The local file containing the body text of the e-mail message to deliver.

OutputFile
The local file name in which to store the prepared file for delivery by **SENDMAIL**. This file is overwritten if it already exists!

Attachment
The name of a local file to be binary attached to this e-mail message. Multiple attachments are created by repeated use of the **–a** parameter. Files are attached as MIME parts, encoded with the application/x-uuencode content type.

Example

```
MAKEMAIL -tfred@yahoo.com -fmary@yahoo.com -sStatus -bmessage.txt -
omail.dat
MAKEMAIL -tfred -tbarney -fwilma -sDinner -bmenu.txt -omail.dat
MAKEMAIL -tfred -fwilma -sBowling -bbody.txt -aStone.jpg -aRock.jpg -
omail.dat
```

Example Script File

MAIL.SCR:

```
-tfred@yahoo.com

-tbarney@yahoo.com

-fwilma@yahoo.com

-sStatus

-bmessage.txt

-aFile1.bin

-aFile2.bin

-omail.dat
```

MEMSTAT

MEMSTAT displays memory usage within SOCKETS. MEMSTAT.EXE is provided with source code, MEMSTAT.C, as an example of how to access SOCKETS memory usage information from within an application.

Syntax

MEMSTAT [F]

Remarks

Without an argument, MEMSTAT displays memory usage as follows (the actual values may differ):

```
MEMSTAT version 1.03
Sockets build 1565
Memory available            16032
Largest available block     15260
Memory allocation failures      0
Memory free errors              0
```

Minimum stack observed 946

With an argument, the following information is added (the actual values may differ):

```
Free chain in segment 14DF:
0A98-0A9F     4
0F3C-4ADB 15260
4B9C-4D33   404
4D5C-4D7F    32
53C8-54BF   244
5500-551B    24
5C7C-5CAB    44
5D00-5D17    20
Total     16032
```

NETBIOS

NETBIOS is a TSR that provides a NETBIOS-compatible network interface.

Syntax

NETBIOS [options]

Options

/a=NameCount

/b=BroadcastFile

/c=NCBs

/l=LanAdapterNumber

/n=HostsFile

/s=SessionCount

/u

Remarks

/a=NameCount
Maximum number of names to cache.

/b=BroadcastFile
Local file containing IP addresses not on the local network segment that should be considered part of the "broadcast" group.

/c=NCBs
Number of NCBs to allocate.

/l=LanAdapterNumber
For the NETBIOS API, the adapter number of this interface.

/n=HostsFile
Local file name containing name-to-IP mappings.

/s=SessionCount
Number of simultaneous sessions to allow.

/u
Running **NETBIOS** again with this option unloads the TSR.

Configuration File

NETBIOS uses a file to statically map names to IP addresses. This is the *HostsFile*. The file contains space-separated parameters in the format:
name IP

NETBIOS uses a second file to list machines that should be added to the local "broadcast" group. This is the *BroadcastFile*. The file contains one parameter per line in the format:
IP

Configuration File Parameters

name
The local alias for this entry.

IP
The remote IP address of this entry.

Example

```
NETBIOS /n=lmhosts
```

Note

Filesharing between a sockets system and other systems can be accomplished by using NETBIOS with third-party or freeware redirector and/or server software.

PDTEST

The PDTEST utility is a diagnostic program that tests loaded packet drivers. PDTEST does not perform a full test since it does not transmit traffic through the drivers, but just checks their status.

It reports such things as the interrupt vector of the packet driver, its class, the MAC address, and information on the status of the driver. PDTEST is useful for checking that the packet driver was actually loaded which interrupt was used, and the class of packet driver. Classes supported by SOCKETS are marked with an asterisk (*) in the following list of recognized classes:

Class 1*	DIX Ethernet_II
Class 3*	802.5 Token Ring
Class 5	Appletalk
Class 6*	SLIP
Class 9	AX.25 Amateur Radio
Class 11*	802.3 with 802.2 headers IEEE
Class 12	FDDI with 802.2 headers
Class 13	Internet X.25
Class 14	Northern Telecom LANSTAR encapsulating DIX
Class 16	Point to Point Protocol for serial lines
Class 17	802.5 Token Ring w/expanded RIFs

Most Ethernet packet drivers support both classes 1 and 11. Class 1 is the default class and should normally be used.

Syntax

pdtest

Example (output)

```
Packet driver found at 0x60
Version 9, class 1, type 57, number 0, functionality 6
Name: MAC/DIS converter
High performance driver
Rev 1.09 par_len 14 add_len 6 mtu 1514 multicast_buf 0
Rcv_bufs 0 xmt_bufs 0 int_num 0x0
Address: 00:00:c0:08:d7:15
Extended driver
Packets:in 511 out 595 bytes:in 112664 out 74476
Errors:in 0 out 0 packets lost 0
```

PING

PING sends ICMP echo requests to an IP host and reports on the reception of subsequent echo replies. Source code is provided as an example of the Basic API (CAPI) and in order for customers to build the functionality into their own applications.

Syntax

PING [options] ip-*address* [*scope-id*]

Remarks

ip address This may be a numeric address or a name address.

Options

/d=*time*	Delay for *time* milli-seconds between pings
/i=*incr*	Increment length of each packet by *incr* from *len* to *max*.
/l=*len*	Length of packet
/m=*max*	Maximum length of packet. Used with /i and /r options
/n=*number*	Number of pings
/q	Quiet, only print stats
/r	Random length from *len* to *max*
/t	Ping until terminated by s, t, q, x or Esc Other keys print current statistics.
/x	XPING-like report on a single line.
/w=*time*	Wait for response for *time* milli-seconds
ip-address	The IPv4 or IPv6 address to be pinged.
scope-id	Used to specify an interface to be used in the case of an IPv6 link-local addresses. It specifies the number of the interface as defined in the configuration file (e.g. SOCKET.CFG) starting at 1.

Examples

```
PING 10.0.0.1 20
```

This will ping the address of 10.0.0.1 every 20 clock ticks.

```
ping /x /t /d=500 host25
```

This will give the same funtionality as XPING host25.

RC.JAR

RC.JAR is a Java remote console applet for connecting to hosts running **HTTPD**. It shows the text-mode contents of the **HTTPD** machine's display memory, and allows fully interactive keyboard input. This is an alternative to the **RCCLI** applet.

Syntax

The link to RC.JAR should be embedded in an HTML page served by the HTTPD server. An example is available in the CGI/ subdirectory of the HTTP applications.

Remarks

RC.JAR has been compiled for use with the Java Development Kit version 1.4.1. The browsers Mozilla 1.x and newer, as well as Microsoft's Internet Explorer 4.0 and newer are supported. In order to use with a Netscape Browser a security certificate must be compiled into RC.JAR.

RC_DK.JAR

RC_DK.JAR is a Java remote console applet specifically for Danish keyboards. Please see **RC.JAR** for more information.

RCCLI, WRCCLI and W9RCCLI

RCCLI is a DOS remote console client for connecting to hosts running **HTTPD**, and is an alternative to the **RC.JAR** applet.**WRRCLI** is a Windows NT, 2000,XP console mode client with the same functionality while **W9RCCLI** is the Windows 9x counterpart without support for IPv6. It shows the text-mode contents of the **HTTPD** machine's display memory, and allows fully interactive keyboard input. To exit the remote console client, press Ctrl-Alt-X.

Syntax

RCCLI *server_address* [*tcp_port*]

WRCCLI *server_address* [*tcp_port*]

W9RCCLI *server_address* [*tcp_port*]

Options

server_address

Specify the IP address or DNS name of the machine running **the Remote Console Server**.

tcp_port

tcp_port defaults to 81, but must be changed if a nonstandard remote console port is chosen for the remote console session during server configuration.

Example

```
RCCLI 10.0.0.1
```

ROUTE

ROUTE is used to display or modify routes. The source code, ROUTE.C, is provided as an example of manipulating routing information.

Syntax

route [print]

route default

route drop <destination>[*/bits*] [/m=*mask*] [/l]

route add <*destination*>[*/bits*] [/m=*mask*] *interface* [*gateway*[*metric*]] [/x] [/p] [/s] [/b] [/l]

Options

/x - proxy

/p - private

/s - static

/b - add at bottom

/l - list new routes

Examples

```
route
   Destination   Bits Interface  Gateway       Metric Proto   Flags Time
   Default          0 if0        192.168.0.200      1 Netmgmt    s
   192.168.0.0     24 if0        none               1 Netmgmt    s
```

SENDMAIL

SENDMAIL delivers e-mail messages packaged by the **MAKEMAIL** application to an Internet mail server. **SENDMAIL** also creates a local log file to indicate successful send or failures.

Syntax

SENDMAIL server file

Options

Server

The IP address or DNS name of the Internet mail server to receive the message.

File

The file, created by the **MAKEMAIL** utility, to deliver.

Logging Format

Timestamp, Code String

Timestamp

Weekday Month Day Time Year

Code

Three digit integer. 000 means perfect success, 100-199 mean usage error and 200-299 means TCP/IP error from server.

String

Human–readable explanation of the error code.

Example

```
SENDMAIL mail.datalight.com mail.dat
```

SETHOST

The SETHOST utility sets an environment variable (default HOSTNAME) to the name contained in a map file (default MACHOST.MF) according to the hardware address (MAC or Ethernet) found by searching for a packet driver tsr. Network management is simplified when using %HOSTNAME% in the SOCKET.CFG files to set IP addresses.

SETHOST can be used in either of two modes:

- To update the MACHOST.MF file or
- To set the HOSTNAME environment variable.

Syntax

sethost [/f=*n* | /n=*hostid*] [/c=] [/m=*map_file*] [/v=*variable*]

Options

without a *hostid* set the variable

/f=*n*
Use *n*th environment block (required for some systems - try /n=1 first.)

/n=*hostid*
This is the IP address of the local PC in symbolic form as in HOSTS or in decimal form to add to the mapfile

/c=
Preserve the case of the environment variable

/m=*map_file*
Use map_file instead of default MACHOST.MF

/v=*variable*
Use variable instead of the default name: SETHOST

Note: The equal signs are required in this case since SETHOST supports applications where the n= is optional. A slash without an equal sign indicates the setting of a host id.

Example

To modify or add an entry in MACHOST.MF:

```
sethost /n=ws_name
```

To set the variable HOSTNAME:

```
sethost
```

Installing SETHOST

Installing SETHOST requires a working installation of SOCKETS. Also, all workstations run SOCKETS from a server disk.

Edit the HOSTS file to add all the workstations' names and IP addresses. We recommend that all the workstation IP addresses be preceded with an asterisk to make them hidden to other users looking into the list of hosts. For example, *198.147.35.120 admin03

Copy the SETHOST.EXE program and an empty file MACHOST.MF to your server, in a directory such as X:\SOCKETS, for example.

At each workstation, log in as supervisor (or have write access to X:\SOCKETS) and execute the DOS commands:

```
x:
CD \SOCKETS\UTILS
SETHOST /N=WS_NAME
SETHOST
SET
```

The SETHOST /N=WS_NAME command creates an entry in the MACHOST.MF file with the name of the workstation and its MAC (Ethernet card) address. This is the important "once-only" command. The next two commands are to verify that the ws_name is stored in the environment variable HOSTNAME.

In the AUTOEXEC.BAT or any batch file executed after login and before running SOCKETS, put the following commands:

```
x:
CD \SOCKETS\UTILS
SETHOST
```

The IP addresses are now linked to the MAC addresses of the network cards. If a network adapter or host system is changed, update the MACHOST.MF file with

```
sethost /ws_name
```

The MACHOST.MF file keeps the mapping from the MAC addresses to the workstation names and the HOSTS file maps the workstation name to its IP address.

The variable name HOSTNAME and filename MACHOST.MF are the defaults for SETHOST.EXE but can be user-specified. Run SETHOST /? to display the available options.

SNTPCLI

SNTPCLI is used for getting system network time information from a system network time protocol (SNTP) server.

Syntax

SNTPCLI *server* [minutes]

Remarks

server The server providing the time service.

Options

minutes An optional parameter which provides an adjustment to the server time in minutes.

Example

```
SNTPCLI 182.109.2.80
```

Retrieves the time information from the server specified.

Time Zones

An additional environment variable for time zones is also supported. The TZ variable allows SNTPCLI to compensate for time zone differences on the SNTP server when setting the local system time By default, if no time zone is set, SNTPCLI assume Greenwich Mean Time (GMT).

Setting the TZ variable is not necessary when using all programs. The syntax for the TZ environment variable is:

SET TZ= <*abbreviation*> +|- *value*

Abbreviation represents any three-letter abbreviation for the chosen time zone. The variable serves as a reminder to the user. For example, if setting the time zone for Pacific Standard Time, the variable could be set as PST and for Eastern Standard Time as EST. The abbreviation is only a placeholder in the syntax for the TZ variable. There are no incorrect abbreviation choices as long as only three letters are used.

Value represents the number of hours this time zone varies from GMT. For example, the west coast of the United States and Canada is –8 hours relative to GMT. This value may have to be adjusted to compensate for daylight savings time. There should be no spaces between the abbreviation, plus or minus sign, and the value. Some examples are:

```
SET TZ=PST -8
SET TZ=CMT -3
SET TZ=GMT+2
```

If an incorrect format for the time zone is entered, the default of GMT is used.

SOCKDIAG

SOCKDIAG **is a utility used to diagnose the SOCKETS Advanced TCP/IP interface. It tests the API as well as the stack and even the network when external servers are specified. It also measures the performance of the network for TCP and UDP traffic. The external server(s) need to run both TCP and UDP echo servers on TCP port 7 and UDP port 7. A Sockets machine can be used as a server by running SUPERD. The source code for SOCKDIAG is supplied as an advanced example of using the Sockets API and can be compiled without any change as a Windows program using Winsock to demonstrate the portability of the code.Syntax**

SOCKDIAG [/b=*bulk_test_seconds*] [/d] [/f=*fail action*] [/l=*local echo port*] [/n] [/r=*remote echo port*] [/s] [/t=*timeout seconds*] [/v=*verbosity*]

Options

/b - set the number of seconds for each traffic test to run.

/d - specify server debugging.

/f - set the action to take on a failure. Valid values are:

0 print error and continue
1 print error and wait for Esc.
2 print error and exit

/l - set the address of the local echo port.

/n - specify that the local loopback traffic tests should be skipped

/r - set the address of the remote echo port.

/s - specifie server debugging.

/t - set the number of seconds before a timeout occurs.

/v option set the level of verbosity. Valid values are:

0 only print errors
1 print the names of all tests
2 print additional information on errors
4 print getaddrinfo() values

Example

```
SOCKDIAG /n server1
```

This will skip the local loopback traffic tests, but test server1.

SOCKSTAT

SOCKSTAT is used to display the status of all sockets (as used for the Basic and Advanced APIs) and also all the UDP listening ports. Note that it is likely that there will be more TCP and UDP connections than sockets in the system. Built-in servers like LPD and most of the server and client applications like FTPD and FTP use the Proprietary API which does not make use of sockets.

Syntax

SOCKSTAT

SRPRINT

SRPRINT is a small TSR allowing a serial printer to be used via BIOS INT17, thus allowing the Sockets built-in Socket Printing and LPD to support serial printers. In addition it allows the SocketPrinting server to act as a Serial Port server (conversion of uni- or bi-directional serial streams to TCP streams)..

Syntax

SRPRINT [options]

Options

/2	two-way traffic
/b=*baud-rate*	
/c=*comm-port*	1 or 2
/d=*data-bits*	7 or 8
/e=*receive-flow-control*	rts, dtr, xon, irts, idtr
/f=*send-flow-control*	cts, dcd, dsr, xon, icts, idcd or idsr

/n=*printer-number*	0, 1, 2 or 3
/l	list current parameters
/p=*parity*	none, odd, even, mark or space
/r	reset flow control
/s=*stop-bits*	1 or 2
/t=*timeout*	timeout in seconds
/u	unload
/z=*buffer-size*	must be more than 40

Example

```
srprint /c=1 /f=xon /n=2 /b=19200
```

This will direct printer port 2 to COM1, use xon/xoff flow control and set the baud rate to 19200

```
srprint /c=1 /l
```

This will list the current settings and status of the serail printer (actual values may differ):

Serial printer rev 2.00 parameters:
Comm port: 1
Printer number: 2
Baud rate: 19200
Data bits: 8
Parity: None
Stop bits: 1
Send flow control: Xon/Xoff
Recv flow control: n/a
Buffer size: 932
Send buffer count: 0
Recv buffer count: 0
Errors:
Flow: 0
Overrun: 0
Parity: 0
Framing: 0
Break: 0
Status: Idle.

TCP

TCP.EXE is a utility used to examine and change the TCP parameters and connections.

Syntax

TCP close *n*

TCP irtt [*n*]

TCP mss [*n*]

TCP reset *n*

TCP retry [*n*]

TCP status [/*columns* [/v=*mode* [*refresh time*]]]

TCP status *n* [e]

TCP window [n]

Remarks

n	Connection number in decimal or a TCB address in hexadecimal.
close	Close connection specified by *n*.
irtt	Set, using *n*, or display the Initial Round Trip Time.
mss	Set, using *n*, or display the Maximum Segment Size.
reset	Reset connection *n*.
retry	Set, using *n*, or display the retry count.
status	Display summary status of all connections.
status *n*	Display detailed status for connection *n*. Add e for extended status.
window	Set, using *n*, or display window size.

Options

columns	The number of columns to display status with refresh.
mode	0 – direct video, 1 – VT100/ANSI sequences, 2 – Standard output..
refresh time	The time in seconds after which an automatic refresh occurs.

The following keys are active while refreshing the display:

Esc	Exit.
d	Enter number of times to read status before displaying it.
f	Toggle freeze/unfreeze.
n	Enter number of newest entries to highlight.
s	Switch to different sort mode: I – Internal (unsorted), H – Host, T - Time
1,2,3,4	Select the number of columnsAny otherRefresh display.

Examples

```
TCP irtt
```

Displays the current irtt value.

```
TCP s /2 1
```

Displays the status of all connections in two columns, refreshing every second, until Esc is pressed.

XPING

XPING starts a continuous string of pings until stopped by a keystroke. XPING has been superceded by PING. Source code is provided as an example of the Proprietary API.

Syntax

XPING *ip address* [*interval*]

Remarks

ip address This may be a numeric address or a name address.

Options

interval The time to wait between pings in clock ticks (each about 55 milliseconds long).

Example

```
XPING 10.0.0.1 20
```

This will ping the address of 10.0.0.1 every 20 clock ticks.

Chapter 15, SOCKETS Server and Client Applications

HTTP Server

Overview

The SOCKETS HTTP server, HTTPD.EXE, is a small, fast, reliable and extendable web server that can run as either an application or TSR. Apart from the minimum required file download capability, the following additional capabilities are provided:

1. Remote Console Server- ability to gain terminal-type access to the server system, using a standard browser, without the need to install any software on the browser computer
2. Authentication – Both system wide and directory wise
3. CGI Extendibility – The ability to extend the server to create dynamic web pages, perform specialized tasks, etc.
4. A Server Side Includes (SSI) interface is provided using the CGI interface, enabling a user to create web pages using HTML templates with variable names, which is substituted in-time with specific values. WebForms, a more comprehensive SSI interface, is also provided allowing WebDos applications to be easily developed. WebDos commander and WTCP are based on WebForms.
5. Ability to run as a background process
6. Flexibility to control physical parameters such as memory usage and number of connections

Server

The HTTP server is used to send static web pages existing as files on the server or dynamically generated web pages to a remote client (browser). Dynamic pages can be generated in two ways:

1. Extension CGI. By calling an external CGI handler, the server provides an API to external handlers. A Server Side Includes (SSI) interface and WebForms are provided as well, which makes it very easy to create powerful interactive web pages.
2. Spawning CGI. The basic mechanism used by CGI is that arbitrary programs can be spawned from the web server with input as received from the remote browser and output that can be sent to the browser.

The Remote Console Server accepts input from a remote client that is fed to the keyboard buffer for use by an arbitrary program using it. It also monitors the screen display buffer area and sends screen information to the remote client.

The SOCKETS password file controls authentication. Authentication is user specific and may also differ from directory to directory. It may also be put off for either some or all users. See the

section on authentication. It is also possible to embed a single backdoor user account into the executable server program file. For security reasons, the documentation for this feature must be requested from Datalight.

The HTTP server can support multiple simultaneous sessions. The GET, PUT and POST request methods are implemented as well as the following MIME types:

text/html, text/plain, image/gif, image/jpeg, image/jpeg and application/octet-stream.

The MIME type is determined by the file extension.

Remote Console Server

Initialization

When the DOS client RCCLI.EXE or the Windows client WRCCLI.EXE or the Windows 9x client W9RCCLI.EXE is used, a connection is simply established to the Remote Console Server on TCP port 81.

When a browser is used as the client it retrieves a page containing a reference to the Remote Console applet that is automatically downloaded if not yet in the cache. The applet then connects to the Remote Console Server (RCS) on TCP port 81. An example download page is supplied as REMCON.HTM.

Almost any application e.g. COMMAND.COM or even a full-screen text editor like NED.EXE can be run on the server. The remote keyboard and display control the application as if they were locally attached.

On the remote side, the client acts as a simple terminal emulator that displays what it receives from the server and sends what is entered from the keyboard to the server.

It is not required to have a real display adapter on the embedded system server, only to have display buffer memory and a BIOS and application software that writes to the display buffer memory.

When a new connection is made, all the screen data, as well as the cursor position, is sent to the client. Subsequently the RCS keeps a watch on the video memory and cursor position and whenever a change is detected, the RCS sends the changed data to the client.

Keyboard data received from the client is passed to the keyboard buffer making it available as keyboard input for use by any application executing on the server.

The remote console applet is a Java 1.4.1 applet, supplied as RC.JAR, and will function on any Java 1.4.1 compliant browser. For Internet Explorer it may be required to download, install and select Sun Java for applet operations. Please note that a security certificate has not been compiled into RC.JAR so it is not compliant with versions of the Netscape browser that require a security certificate to run Java applets. For additional information about RC.JAR or RCCLI.EXE, please see the Utility Description Chapter.

Extension CGI

The SOCKETS HTTP servers (HTTPD/HTTPFTPD) provide a facility to call functions in other modules which may be TSR or transient programs. These functions are referred to as “HTTPD extensions.” For more information please see the “ROM-DOS Developer’s Guide” section “CGI Application API".

Extension CGI Examples

A number of examples are included to demonstrate the usage of both the Spawning and Extension API. Source code is included, as well as a make file and a BorlandC 5 IDE file.

Put all *.htm* and *.exe* files in the %HTTP_DIR% (default is \dl\sockets\server) directory and start *HTTPD, HTTPFTPD or SUPERD*. The CGI programs may be pre-loaded or WebDos Commander may be loaded and used to invoke the CGI programs. Examples may be accessed through *index.htm*.

The only Spawning CGI example is *form.exe* and it is accessed through *form.htm*. Please note that COMMAND.COM must not be the currently executing program on the server as it uses all available free memory. WEBDOSC.EXE is a good program to have executing on the server.

The examples may operate in one of two modes:

As a TSR (resident) program: this is the default behavior. Unloading of the TSR can be performed by the user from the remote browser session or by unloading the server. De-registration is possible by loading the program again. This routine may be repeated.

As a transient program: use the ‘/t’ command line switch to activate. This option will immediately spawn ‘command.com’. From this prompt other cgi programs may be loaded. The program exits when ‘command.com’ is exited by typing ‘exit’ at the prompt.

These programs are:

WEBDOSC

WebDos Commander presents a "Commander" like interface via a remote browser allowing a user to navigate the directory, copy, view, delete and execute files and create and delete folders (directories). WEBDOSC is best run as a transient program and not a TSR since that makes it possible to execute other programs which is not possible when COMMAND.COM is executing. Access it from the browser as *webdosc.htm*.

WTCP

WTCP dynamically displays the status of TCP connections on the server machine. Access it from the browser as *wtcp.htm* or from WebDOS Commander as *wtcp.exe*. WTCP can be unloaded using the browser interface by pressing the "Exit" button.

CGIDEMO

This program contains three Extension API functions:

1. A simple program that accepts data from a user and echoes it back nicely formatted. Access *echoform.htm* from the browser.

2. A page visit counter. Access *num.htm* from the browser.

3. Does the same as the *form.exe* spawn example. Get *caform.htm* from the browser.

SSI

A simple SSI implementation that demonstrates the SSI interfaces. *Template.htm* is filled by some variables. Get *ssi.htm* from the browser.

FFUR (Form-base File Upload Receiver)

It handles the upload of a file using POST commands. Access *ffur.htm.*

Passive Mode

The server may be run in passive mode by specifying a '/p' command line switch. When passive, the server will record network events but only handle them once it is triggered by a CGI user.

Server Memory

The server's memory usage may be controlled in two ways:

1. By specifying the amount of memory when going TSR.

2. By specifying the maximum number of connections the server will allow.

Option 1 is the recommended option. Use Option 2 if you have 'heavy' web pages – usually the type where pages consist of frames and many images, etc. Connections are generally reset when more connections are attempted than the defined maximum. The client then must retry to establish the lost connections, leading to a more distributed load on the server.

Spawning CGI

An external program, indicated by the requested URL, is spawned. All relevant information is passed as environment variables. The CGI program gets all input (e.g. posted data) from *standard in* and sends all response through *standard out*. Spawning CGI is discouraged in favor of Extension *CGI*. For more information please see the "ROM-DOS Developer's Guide" section "CGI Application API".

Authentication

Default authentication matches the capabilities of the FTP server as documented in the section "FTP Server" on page 252. A file called "SOCKET.UPW" should exist in the SOCKETS (environment variable) directory.

The default permission file controls remote console access. Each listed user has a single-letter privilege code set if he has privilege to use the Remote Console. The code should be missing if that user does not have Remote Console privilege.

An additional authentication feature is implemented - **htaccess**. This feature provides a per-directory permission override mechanism. It is enabled using '/t' as command line switch. If

htaccess is enabled, the default mechanism may be skipped (but no default users or remote console access will be available).

A file called HTACCESS (typically hidden) contains authentication overrides to enable partial anonymous access or additional password security to subdirectories, etc. If this feature is activated, the server code will look for HTACCESS files in each directory starting from the requested path and continuing upward in the directory structure (assuming the root directory to be at the top) until an HTACCESS file is found. If no file is found, then the default settings are used. An anonymous access entry is available for the developer to specify that some subdirectory is authorized for any user, although its parent directory is password-protected. CGI scripts can also be controlled via the HTACCESS mechanism.

HTTPD Program

The syntax for HTTPD is:

HTTPD [options] [<http_port>] [<rc_port>]

Any combination of these switches may be used. They should be separated by at least one space.

Option	Description
/? /h	display help screen
/r	run server in TSR mode
/s	display server status
/t	enable htaccess directory level authentication
/u	unload if resident
/c	close listen
/d	do not start remote console
/g	allow old type (spawning) CGI
/p	Passive mode
/i=*InterruptNumber*	Interrupt number for cgi API
/m=*MemorySize*	set memory size
/n=*MaximumConnections*	number of simultaneous connections>
/a=*ScreenX*>, <*ScreenY*	set screen aspect
/v=*ScreenBufferSegment* [*: ScreenBufferOffset*]	set video buffer address (hex)
/k	Abort all active connections without confirmation when unloading.
/l=*Pathname*[,*CacheEntries* [,*Timeout* [,*TimeFormat*[,*Format*]]]]	Log login/out events to a file.

Remarks

ScreenX, ScreenY

The width and height of the screen area to serve for the remote console session. These values default to 80 and 25, respectively.

ScreenBufferSegment, ScreenBufferOffset

Together, a pointer to the top-left corner of the display memory to serve for the remote console session. These values default to B000 and 0000 respectively, for monochrome display adapters and to B800 and 0000 respectively, for color display adapters.

MemorySize

The maximum amount of memory available to the server. The default value is 32K. The value of m can range from 8192 to 63472.

MaximumConnections

The maximum number of simultaneous connections allowed by the server.

InterruptNumber

The interrupt number to access the CGI API.

Pathname

The pathname to log login/logout events to.

CacheEntries

The number of cache entries for keeping track of authenticated HTTP (Web) sessions. An HTTP session is not uniqely defined as is the case of an FTP or Remote Console session where specific login and logout events occur. In the case of HTTP each request must be authenticated by means of an Authentication Header. This is normally done automatically by the client (Browser) by presenting a single login dialog and applying the values entered to all requests sent to the specific remote host and port. There is never an explicit logout event which is sent to the server. To simulate a logout event, HTTPD keeps the username/password combinations of a number of "sessions" in a cache with a timout period. When a new request for an existing entry is received, the timeout period is reset to the maximum value. When the timeout expires, the session is deemed to be logged out. If too many sessions for the specified number of cache entries are required, the oldest session is "logged out" and the entry is re-used for the new session. A subsequent request with the username/password of the logged out session, will be handled as a new session. The default number of entries is 20.

Timeout

The timeout period for cache entries in seconds. The default is 900 seconds (15 minutes).

TimeFormat

The format in which the time field is logged, can be specified using the specifiers used by the strftime() funtion of C. The default format is "%m-%d-%y/%I:%M%p". If it is required to use a ',' in any of the formats, a different non-digit character should be used to terminate the *Timeout* parameter e.g. a ';'. The same character should be used to terminate the *TimeFormat* parameter if a *Format* parameter is also given.

Format

The format of a log event entry can be specified as in the C printf() function. The default format is "%-3s %-10.10s %-10.10s %s %-20.20s". All arguments are string variables. The first argument is a three character string with the first character specifying the Service as follows:

F - FTP, H - HTTP, R - Remote Console

The second character specifies the type of event as follows:

I – login, O – logout, S – startup.

The third character specifies the status of the event as follows:

S – Success, F - Failure

The second argument is the Username, the third the Password, the fourth the Time (as specified by the *TimeFormat*) and the last the IP address. Whenever a parameter is not applicable, "---" is used.

http_port
HTTP port to listen on. This parameter defaults to the standard HTTP port number of 80.

rc_port
Remote Console port to listen on. This parameter defaults to 81.

The "root" directory for web content is the current directory when HTTPD is started. This can be changed by setting an environment variable HTTP_DIR e.g.

SET HTTP_DIR=D:\SERVER\WEB

Format of "SOCKET.UPW"

This is the same file used for the FTP server's (*FTPD.EXE*) permissions. This file consists of lines where each line contains a user's information. A line starting with a # is considered a comment and is ignored. Each line consists of four fields:

<Username> <Password> <Working Directory> <Permissions> [# comment]

Username: The name of this user. If it is *, it will be used when the client does not specify a username.

Password: This user's password. If it is *, no password is required

Working Directory: The user will only have access to this directory and its subdirectories. If it is '/', this user has access to the whole system. HTTP_DIR can be referred to as '\'. If a relative path is specified, it is appended to HTTP_DIR.

Permissions: IMPORTANT when a user is granted both FTP and HTTP permissions, the FTP permissions must appear **first**, otherwise they will be ignored. Operations allowed. May contain any combination of the following tokens:

e - User may 'g**e**t' files
p - User may '**p**ost' data (Only allowed for CGI)
u - User may 'p**u**t' files
g - User may use c**g**i
m - User may use Re**m**ote Console

Fields should be separated by single spaces. If any field is missing the entry is ignored. A comment may follow the last field (permissions) of the line.

Note: If a default user is supplied, it should always appear first in the list of users. Only users below the default user will be considered.

Format of "htaccess"

Any directory may contain this file, and serve as overrides to the general permissions for the containing directory and all its subs until another htaccess is found. This file consists of lines where each line contains a user's information. A line starting with a # is considered a comment and is ignored. Each line consists of three fields:

<Username> <Password> <Permissions> [# comment]

username:	The name of this user. If it is *, it will be used when the client didn't specify a username.
Password	This user's password. If it is *, no password is required.
Permissions	Operations allowed. may contain any combination of following tokens: **e** - User may 'g**e**t' files **p** - User may '**p**ost' files **u** - User may 'p**u**t' files **g** - User may use c**g**i

Fields should be separated by single spaces.If any field is missing the entry is ignored. A comment may follow the last field (permissions) of the line.

Note: If a default user is supplied, it should always appear first in the list of users. Only users below the default user will be considered.

FTP Server

FTPD is a file server that can run either as an application or as a TSR. The name of the server as displayed in the banner is determined by the HOSTNAME environment variable. If the environment variable is not set, the name "Socket" is used. The user password file, SOCKET.UPW, in the SOCKETS directory (indicated by the SOCKETS environment variable) controls access.

A temporary file is created when a directory listing is requested. This file is created in the current directory, but can be created in any directory as specified in the FTPDIR environment variable.

FTPD Program

The syntax for FTPD is:

FTPD [options] [<ftp_port>]

Option	Description
/? /h	display help screen
/r	run server in TSR mode
/s	display server status
/u	unload if resident
/c	close listen

/m=<MemorySize>	set memory size
/n=<MaximumConnections>	number of simultaneous connections
/k	Abort all active connections and unload

Remarks

MemorySize

The number of bytes of memory available to the server. This value defaults to 32768.

MaximumConnections

The maximum number of simultaneous connections allowed by the server.

ftp_port

FTPD will listen on the listed port. This parameter defaults to the standard FTP port number of 21.

Configuration File

FTPD uses the standard SOCKET.UPW file for validating logins. The file is composed of text lines, each representing a login name, password, and the configuration to use for a session opened with those credentials. Space characters separate the parameters in the file, which are in the following format:

name password directory rights

The location of the username/password file to be used by the server is specified by the environment variable SOCKETS as follows:

%SOCKETS%\SOCKET.UPW

If the variable SOCKETS is not specified, the following file is used:

\DL\SOCKETS\SOCKET.UPW

Configuration File Parameters

name

The login name of this record.

password

The password to authenticate a user trying to login as this name.

directory

The starting directory for this user.

rights

Up to four characters specifying which permissions this user is granted:

r means that this user has read access.

w means that this user has write access.

c means that this user has permission to make new directories.

d means that this user has permission to change to a directory other than his starting location and subdirectories from the starting location.

Example Socket.upw

```
Admin admin c:\ drwc
Guest * c:\guest dr
```

Example Command Line

```
FTPD /m=40000 /r
```

FTP Server Commands

The following commands are recognised by the SOCKETS FTP server:

Command	Description
abor	cancel an incomplete transfer
acct	specify account – ignored by server
appe	"put" a file at the server but append it if the file exists
cdup	change directory up
cwd ***directory***	change server directory
dele ***file***	delete a server file
epasv	request extended connection information from the server in order to make a connection to the server for transfer of data
eprt	send extended port information to the server requesting the server to make a data transfer connection
feat	list special features supported
help	request a list of implemented commands
list [*file* **|** ***directory*****]**	give a long directory listing
mdtm [*file* **|** ***directory*****]**	list date and time of file or directory
mkd ***remote_directory***	create a server directory
nlst [*file* **|** ***directory*****]**	gives a short names-only directory listing
noop	no operation – acknowledged by server
pass [*password***]**	password for username
pasv	request connection information from the server in order to make a connection to the server in order to transfer data
port	send port information to the server requesting the server to make a data transfer connection
retr ***remote_file***	transfer a file from the server in the current mode
stor ***local_file***	transfer a file to the server in the current mode
pwd	print working directory
quit	terminate FTP session
rmd ***remote_directory***	remove (delete) directory
rnfr ***existing_filename***	rename a file, command 1 of 2
rnto ***new_filename***	rename a file, command 2 of 2
size ***file***	report the file size in bytes as a message prefixed with 213
stat	report the status of a transfer or active connections
syst	return operating system information from the server
type [i | a]	report or select the file transfer mode: image (binary) or ASCII
user [*username***]**	username to logon

Combined HTTP, RC and FTP Server

HTTPFTPD is a combined HTTP, RC and FTP server that can run either as an application or as a TSR. By default, it processes normal HTTP requests on port 80 and normal FTP requests on port 21 and Remote Console on port 81. Refer to HTTPD and FTPD descriptions for information on using HTTPFTPD.

HTTPFTPD Program

The syntax for FTTPD is:

HTTPFTPD [*options*] [<http_port> [<ftp_port> [<rc_port>]]]

For *options* refer to the description of HTTPD and FTPD.

http_port
HTTP port to listen on. This parameter defaults to the standard HTTP port number of 80.

ftp_port
FTP port to listen on. This parameter defaults to the standard FTP port number of 21

rc_port
Remote Console port to listen on. This parameter defaults to 81.

Example Command Lines

```
HTTPFTPD /m=40000 /r
HTTPFTPD /a=80,25 /v=a000:0000 /r
HTTPFTPD /l=%http_dir%\netacces.txt,10,120;%x,%X;%s,%s,%s,%s,%s
```

The last example will generate a Comma Seperated Variable log file in the Web root directory of the web server.

Combined HTTP, FTP, RC and Echo Server

SUPERD is a combined HTTP, RC and FTP server as well as TCP and UDP Echo servers that can run either as an application or as a TSR. By default, it processes normal HTTP requests on port 80, normal FTP requests on port 21 and Remote Console on port 81. Echoservers for both TCP and UDP are at ports 7. Refer to the **HTTPFTPD** description for information on using **SUPERD**.

SUPERD is useful for running in a target system when using CAPIDIAG or SOCKDIAG to test a network.

Appendix A, Packet Drivers

Overview

SOCKETS provides support for a wide range of LAN adapters supporting the Packet driver specifications.

The packet driver specification is adhered to by many vendors of LAN adapters and is also freely available as public domain software from the Internet e.g. from www.crynwr.com . SOCKETS only supports the packet driver specification, but public domain converters or "shims" are available to convert from NDIS or ODI to packet driver. Some "shims" may be obtained from Datalight Inc. but are not distributed with SOCKETS. SOCKETS may use up to eight packet drivers.

Using the same network board, SOCKETS can operate simultaneously with other network operating systems such as Novell, Microsoft, Banyan and others.

Note: Software configuration of network hardware, such as Plug and Play settings or packet drivers, must be completed before SOCKETS is loaded. Failure to properly load and configure the appropriate software results in error messages from SOCKETS. To help you isolate which device is failing; the **interface** command is referenced in those error messages.

For development using Microsoft Windows, it is recommended to purchase an NDIS3 Virtual Packet Driver from www.danlan.com . Versions are available for both Windows 9X and Windows NT/2000. Use a different IP address for SOCKETS than that used by Windows.

Note: SOCKETS can be run in a Console Window (DOS box) using Windows NT/2000, but problems may be experienced scheduling it unless constantly calling an API function. XPING can be used for this purpose to run TSR servers.

The supplied utility PDTEST.EXE can be used to test or diagnose your packet driver before attempting to start SOCKETS. For further information on PDTEST, refer to Appendix ?? "Managing the Network and Troubleshooting."

Packet Driver Installation

After you have installed SOCKETS, copy your NIC (Network Interface Controller) packet driver, from the NIC Driver disk. The various manufacturers supply their own packet drivers that may differ from what is documented here. Always consult the software and documentation supplied with your network controller first.

Note: Many PCI packet drivers require no command line parameters to load and, by default, set up an interrupt vector of 0x60.

Using a Memory Manager with a Packet Driver

If a board using mapped memory (for example, SMC) is used with an upper memory block manager (EMM386), the shared memory must be excluded:

```
DEVICE=C:\DOS\EMM386.EXE X=D000-D3FF
```

Packet Driver over ODI Driver Installation

If you already have Novell using ODI installed, just modify AUTOEXEC.BAT and the existing NET.CFG, otherwise make a \ODI directory on your hard drive and copy the following files to it:

Filename	Location
LSL.COM	Novell WSGEN floppy disk
NETX.EXE or VLM.EXE	Novell WSGEN floppy disk
IPXODI.COM	Novell WSGEN floppy disk
ODIPKT.COM	NIC Driver disk *
NIC ODI Driver	NIC Driver disk

*** Note:** ODIPKT.COM may not be provided by your vendor. In that case, there are many solutions available on the Web – just do a search for "odipkt.com".

Examples of ODI Drivers:

SMC8000.COM, SMCPLUS.COM, NE2000.COM, 3C5X9.COM or 3C503.COM

If you do not have a NET.CFG file, create an ASCII text file in the \ODI directory called NET.CFG that should look similar to the following:

```
Link Support
   buffers 8 1600
Protocol IPX
   Bind ODI_driver
Link Driver ODI_driver
   int irq
   port io port
   frame ETHERNET_802.3
   frame ETHERNET_II
```

The important parts to check are the buffers in the Link Support section and the order of the Ethernet Frame (also called Envelope Type) lines. Each Frame line specifies a logical board, starting from number 0. ODIPKT should link to the Ethernet_II board, which, in this example, would be board number 1. The file must contain at least the following:

```
Link Support
```

```
   buffers 8 1600
Link Driver ODI_driver
   frame ETHERNET_II

          Example for SMC:
Link Support
   buffers 8 1600
Link Driver SMCPLUS
   Port #1 280
   mem #1 000D0000 2000/10
   Int #1 3
   frame ETHERNET_802.3
   frame ETHERNET_II
```

Add the following lines to your AUTOEXEC.BAT file:

```
CD\ODI
LSL
rem Your NIC ODI driver
ODIPKT 1 96
IPXODI
NETX
F:
```

The syntax for ODIPKT.COM is:

ODIPKT logical_board interrupt_vector

The interrupt vector must be specified in decimal; for example 0x60 = 96.

logical_board is the index of the Frame type entry starting at 0. The normal frame type to use with SOCKETS on Ethernet is ETHERNET_II which is the second entry (or logical board 1) in the preceding example.

Example

```
CD\ODI
LSL
SMCPLUS
ODIPKT 1 96
```

Using a Memory Manager with an ODI Driver

If a board using mapped memory (for example, SMC) is used with an upper memory block manager (for example, EMM386), the shared memory must be excluded as follows:

```
DEVICE = C:\DOS\EMM386.EXE X=D000-D3FF
```

Packet Driver over NDIS2 Driver Installation

After you have installed SOCKETS, make a \LANMAN directory on your hard disk and copy the following files to it:

Filename

PRO.MSG
PROH.MSG
PROTMAN.DOS
DIS_PKT.DOS
NETBIND.COM
NDIS 2 Driver for NIC

Add the following lines to your CONFIG.SYS file in the following order and not separated by any other command:

```
DEVICE=C:\LANMAN\PROTMAN.DOS
DEVICE=C:\LANMAN\<Your NIC's NDIS driver>
DEVICE=C:\LANMAN\DIS_PKT.SYS
```

Example

```
DEVICE=C:\LANMAN\PROTMAN.DOS
DEVICE=C:\LANMAN\SMC8000.DOS
DEVICE=C:\LANMAN\DIS_PKT.DOS
```

Add the following line to your AUTOEXEC.BAT file

```
C:\LANMAN\NETBIND
```

Create an ASCII text file called PROTOCOL.INI in the \LANMAN directory to pass parameters to the various drivers:

```
[PROTOCOL MANAGER]
   DRIVERNAME=PROTMAN$
[PKTDRV]
   DRIVERNAME=PKTDRV$
   BINDINGS=<label_name>
   INTVEC=0x60
[label_name]
   DRIVERNAME= Your NIC's NDIS driver name
   IRQ=irq
   RAMADDRESS= ram_base_addr
   IOBASE= io_base_addr
```

Example

```
[PROTOCOL MANAGER]
   DRIVERNAME=PROTMAN$
[PKTDRV]
   DRIVERNAME=PKTDRV$
   BINDINGS=WDMAC
```

```
    INTVEC=0x60
[WDMAC]
    DRIVERNAME=WDMAC$
    IRQ=3
    RAMADDRESS=0xD000
    IOBASE=0x280
```

Using a Memory Manager with an NDIS Driver

If a card using mapped memory (e.g. SMC) is used with an upper memory block manager (e.g. EMM386), the shared memory must be excluded as follows:

```
DEVICE = C:\DOS\EMM386.EXE X=D000-D3FF
```

For more information on the NDIS drivers consult your network operating system documentation.

Appendix B, Network Management and Troubleshooting

This chapter describes solutions to common LAN problems, both configuration and performance.

Network Management

The Network Manager is expected to:

- Setup each SOCKETS application according to user requirements.
- Monitor the status of various connections and trace traffic as it traverses the network, in order to resolve problems.
- Modify the software configuration to align it with changes in the physical environment on which it runs.

Configuration Case Studies

Managing Host Names on a File Server-Based LAN

The SETHOST.EXE program manages the host names on a file server based LAN. The purpose of running SETHOST.EXE is to keep all the IP addresses in a single file on the server and allow all workstations to run the same software setup and yet maintain a unique IP address at each workstation. An alternative for non-file server-based networks is to use BOOTP or DHCP where a suitable server is available.

Installing SETHOST

Edit the HOSTS file to add all the workstation names and IP addresses. We recommend that all the workstation IP addresses be preceded with an asterisk to make them hidden to other users looking into the list of hosts. For example,

```
*198.147.35.120    admin03
```

Copy the SETHOST.EXE program and an empty file MACHOST.MF to your server in a directory that is named, for this example, X:\SOCKETS.

At each workstation, log in as supervisor (or have write access to X:\SOCKETS) and execute the DOS commands:

```
x:
cd \SOCKETS\DOS
SETHOST /N=WS_NAME
SETHOST
SET
```

The SETHOST /N=WS_NAME command creates an entry in the MACHOST.MF file with the name of the workstation and its MAC (Ethernet board) address. This is the important “once-only”

command. The next two commands are to verify that the *ws_name* is stored in the environment variable HOSTNAME.

In the AUTOEXEC.BAT, or any batch file executed after login and before running SOCKETS, put the following commands:

```
x:
CD \SOCKETS\DOS
SETHOST
```

In SOCKETS, set the IP address in SOCKET.CFG as follows:

```
ip address \HOSTNAME\
```

The IP addresses are now linked to the MAC addresses of the network cards. If you change a network board or swap a PC, must update the MACHOST.MF file with

```
sethost /ws_name
```

The MACHOST.MF file keeps the mapping from the MAC addresses to the workstation names and the HOSTS is used to map the workstation name to its IP address.

The variable name HOSTNAME and filename MACHOST.MF are the defaults for SETHOST.EXE but they can be user specified. Execute sethost /? to see the available options. See also ".

System Timer Interrupt Use

The timer interrupt (INT 1CH) and the hardware interrupt vectors specified in the ***interface*** command(s) or found automatically in Packet Drivers by SOCKETS, are hooked. Whenever such an interrupt occurs or when the API is called, the SOCKETS *scheduler* is called. The *scheduler* looks for queued incoming packets (queued at interrupt time by the Packet Driver or serial port driver) as well as the timer queue for timeouts, such as not receiving a TCP acknowledgment in time.

Packets are generally sent when a packet is received or the API is invoked, unless an ARP resolution is in progress, the TCP connection is not yet established, the Nagle heuristic is in operation or the offered window does not allow it. UDP packets are generally sent immediately when received by the API unless an ARP resolution is in progress.

Whenever SOCKETS is executing, it sets a BUSY flag and when the API is called during this time, which is only possible if it is called from an interrupt service routine, the API call fails with ERR_RE_ENTRY. Testing the BUSY flag before executing an API call can circumvent this error. The address of the BUSY flag can be obtained by the GET_BUSY_FLAG low-level API call.

The timer interrupt is assumed to be the standard PC timer interrupt with a period of approximately 55 ms. The exact period of the timer interrupt at INT 1CH is not important, but modifying the period will affect the scheduling of the kernel.. Too long a period may cause erratic behaviour and too short a period may cause excessive overhead. The important value for timing purposes is the BIOS timer variable at absolute location 046CH. The DWORD at 046CH MUST increment at a rate of 65536 increments per hour. (About 18 per second).

Advanced Network Configuration

SOCKETS offers additional networking capabilities for large networks. Using the Routing Information Protocol (RIP), SOCKETS can be configured to be aware of multiple IP routers/gateways.

BOOTP servers are detected when SOCKETS is started without specifying an IP address or an address of 0.0.0.0. To trace the BOOTP negotiations, use a trace all **iodt** command in your .CFG file before defining any interfaces.

DHCP servers are detected and used when SOCKETS is started with an IP address of 0.0.0.1.

For file server linked networks the SOCKETS utility SETHOST can be used to centralize management of IP addresses. SETHOST maintains a file mapping of the Ethernet (MAC) address of each machine to an IP address.

SOCKETS' Alternative Routing feature allows more than one route to be specified to a particular host or network. Failure of one route causes an automatic switch to the next route. The failed route is tested periodically and used again when it becomes available.

Tuning TCP/IP

Tuning a computer is a trade-off between the speed of operation and the amount of memory it uses. Performance depends on the number of TCP connections for the computer; more sessions require more memory.

TCP Retry Strategy

If there is a delay in your network connections, SOCKETS employs an intelligent retry strategy. A retry is attempted after a retry interval that gets longer as a function of the number of the retry. The first retry is attempted after the current RTT (Round Trip Time) plus one PC clock tick (18 milliseconds) has elapsed without a response. SOCKETS calculates the RTT as a smooth average of past measured RTTs, starting with the IRTT on a new connection.

For the first five intervals, the time doubles, giving interval lengths of 2, 4, 8, 16 and 25 times the RTT. Then, the square of the interval number is used starting with 5-squared, giving 25 times RTT. Consequently, increasing the number of retries can cause the total elapsed time to become quite long. More than 255 retries results in an infinite number of retries, causing connections to never time out.

When a SOCKETS station starts up, it sends a broadcast ARP request with its IP address to check for duplicate IP addresses. Any SOCKETS client in a retry mode picks up this ARP. Then it retries immediately without waiting for the next scheduled retry time.

Number of retries	1	2	3	4	5	6	7	8	9	10	11	12
Interval length (in RTT)	1	2	4	8	16	25	36	49	64	81	100	121
Total time (in RTT)	1	3	7	15	31	56	92	141	205	286	386	507

To get the current RTT in use for a connection n, use the **tcp status n** command that gives the smoothed average RTT indicated by SRTT.

Keep-alive

All SOCKETS servers test established connections after a minute of no-traffic by sending an empty packet with a decreased sequence number and waiting for the acknowledgement. If the server does not receive an acknowledgement it retries using the retry strategy described above with the smoothed Round Trip Time (RTT). When all the retries have failed, the connection has timed out and the server resets that connection. This prevents servers from hanging in a connected state when the remote client has stopped responding.

Troubleshooting

Problems with LICENSE.DAT File

For SOCKETS demo only (socketmd.exe and socketpd.exe).

The SOCKET environment variable is required in the demonstration version to indicate the directory with the LICENSE.DAT file, which contains the license information.

The LICENSE.DAT file contains your license information in demonstration versions. When this error message appears, the most frequent problem is that the file is in the wrong directory. SOCKETS looks in the SOCKETS directory (as given in the SOCKET environment variable) for the LICENSE.DAT file and then (to accommodate simple new installations) in the \SOCKETS directory of the current drive. If the file contents have been damaged, it will not run. The information in the LICENSE.DAT file is displayed when you start. The number next to SL indicates the number of concurrent users allowed.

XPING

The XPING utility is the most basic test to see if connections are working. Always first try to ping a host that does not seem to respond. Failure to get a response to a ping can usually be traced to one of the following reasons:

- Network cable not plugged in.
- Incomplete bind of the drivers on the local machine. (Carefully check all of the diagnostic messages while booting).
- Inadequate routing information. It may also mean an invalid return route somewhere.
- Lost packages along the route. Sending many ping requests and get only some back; could relate to network hardware problems.
- Remote host is not responding (not switched on, software not loaded, not connected, and so on).

A ping response displays the time taken to get a response. Note that the timing depends on the clock ticks. In an 80x86 PC these ticks are approximately 55ms, so limit the accuracy of the reported times to 55ms.

Utility Programs

The utilities described in the following sections will help you to configure and test your SOCKETS installation.

PDTEST, Packet Driver Test Utility

The PDTEST utility is a diagnostic program that tests loaded packet drivers. See PDTEST in "**Chapter 6, ROM-DOS Utility Descriptions**" for more information.

SETHOST, IP Address Maintenance Utility

The SETHOST utility sets an environment variable (default HOSTNAME) to the name contained in a map file (default MACHOST.MF) according to the hardware address (MAC or Ethernet) found by searching for a packet driver tsr. See SETHOST in "**Chapter 6, ROM-DOS Utility Descriptions**" for more information.

IPSTAT, IP and Memory Statistics Utility

The IPSTAT utility returns statistics on IP and memory. See IPSTAT in "**Chapter 6, ROM-DOS Utility Descriptions**" for more information.

SOCKETS Glossary

Address Mask (also referred to as NetMask)

A bit mask used to select bits from an IP address for subnet addressing. The mask is 32 bits long, and selects the network portion of the IP address and one or more bits of the local portion.

ANSI (American National Standards Institute)

A group that defines U.S. standards for the information processing industry. ANSI participates in defining network protocol standards.

API (Application Program Interface)

An API is a specification of the methods an application programmer can use to access services provided by a software module. In the case of a network, the API specifies the interface to the network software. In TCP/IP, the idea of a "Socket" as the endpoint of a connection is used. A "socket" then refers to an abstraction to define the endpoint of a connection as far as the API is concerned. A socket can be created, opened, read, written, closed, and deleted in much the same way a file is handled in DOS. The difference is that two sockets must exist, normally on two hosts, before a connection can be made. A read operation on one side must always have a matching write operation on the other side.
A common way of interfacing a terminal emulator to networking software in a PC is to use Interrupt 14h. This is the PC BIOS entry point for serial port support, but when used for networking purposes, the original entry point is reused to provide a similar, but much expanded function. In addition to the native character at a time transfer, block transfers are also offered to increase throughput.

ARP (Address Resolution Protocol)

The TCP/IP protocol used to dynamically bind a high-level IP Address to a low-level physical hardware address. ARP is used across a single physical network and is limited to networks that support hardware broadcast.

Baud

Literally, the number of times per second the signal can change on a transmission line. Commonly, the transmission line uses only two signal states making the baud rate equal to the number of bits per second that can be transferred. The underlying transmission technique may use some of the bandwidth, so it may not be the case that users experience data transfers at the line's specified bit rate.

BIOS

Basic Input Output System – software that interfaces directly with the hardware.

BIOS extension

A short program that the BIOS recognizes and executes as the BIOS initializes the system.

Boot

Booting is restarting and reloading DOS. A PC can be booted by turning it off and then turning it on or by pressing the Ctrl, Alt, and Del keys simultaneously.

Bootable disk

A system disk that contains the files necessary to start and run the computer.

BOOTP (Bootstrap Protocol)

A protocol a host uses to obtain startup information, including its IP address, from a server.

Broadcast

A packet delivery system that delivers a copy of a given packet to all hosts that attach to it is said to broadcast the packet. Broadcast may be implemented with hardware or software.

Built-in device

Built-in device is an input/output device which is part of the DOS kernel.

CSLIP (Compressed Serial Line Internet Protocol)

CSLIP is an enhancement of SLIP by implementing Van Jacobson header compression. CSLIP uses more memory than SLIP but provides better throughput and faster response times, especially on small packets.

Datagram

The basic unit of information passed across a TCP/IP connection. An IP datagram is to an Internet as a hardware packet is to a physical network. It contains a source and destination address along with data.

DHCP (Dynamic Host Configuration Protocol)

A protocol that a host uses to obtain all necessary configuration information including IP address.

DNS (Domain Name Server)

The on-line distributed database system used to map human-readable machine names into IP addresses. DNS servers throughout the connected Internet implement a hierarchical namespace that allows sites freedom in assigning machine names and addresses. DNS also supports separate mappings between main destinations and IP addresses.

Domain

A part of the DNS naming hierarchy. Syntactically, a domain name consists of a sequence of names separated by periods.

DOS

Disk Operating System – an operating system that relies on disks for file storage.

DOS kernel

The DOS kernel is the part of DOS that handles a standard DOS call (Int 21h). It handles opening, reading/writing of files, loads programs, and manages memory.

FAT

File Allocation Table – a data table which allows DOS to keep track of file location on the disk so that they can be accessed by programs running on DOS.

Flow control

Control of the rate at which hosts or routers inject packets into a network or Internet, usually to avoid congestion.

FTP (File Transfer Protocol)

The TCP/IP standard, high-level protocol for transferring files from one machine to another. FTP uses TCP.

Gateway

Originally, researchers used the term IP gateway for dedicated computers that route packets; vendors have adopted the term IP router. Gateway now refers to an application program that interconnects two services.

ICMP (Internet Control Message Protocol)

An integral part of the Internet Protocol that handles error and control messages. Specifically, router and hosts use ICMP to send reports of problems about datagrams back to the original source that sent the datagram. ICMP also includes an echo request/reply used to test whether a destination is reachable and responding.

IPCP (IP Control Protocol)

A PPP protocol responsible for configuring the IP protocol parameters on both ends of the point-to-point link.

IPCPIN

A PPP protocol monitoring incoming requests responsible for configuring the IP protocol parameters on both ends of the point-to-point link. This was implemented to allow one instance of SOCKETS to act as both a client and server.

IP (Internet Protocol)

The TCP/IP standard protocol that defines the IP datagram as the unit of information passed across an Internet and provides the basis for connectionless, best-effort packet delivery service. IP includes the ICMP control and error message protocol as an integral part. The entire protocol suite is often referred to as TCP/IP because TCP and IP are the two fundamental protocols.

LAN (Local Area Network)

Any physical network technology designed to span short distances (up to a few thousand meters). Usually, LANs operate at tens of megabits per second through several gigabits per second.

LCP (Link Control Protocol)

A PPP protocol responsible for establishing, configuring, and testing the data link connection.

LCPIN

A PPP protocol monitoring incoming requests which is responsible for establishing, configuring, and testing the data link connection.

Memory disk

A disk that uses either ROM or RAM for the disk media. The memory disk has a FAT, directories, and file data.

MIME (Multipurpose Internet Mail Extensions)

A standard used to encode data such as images as printable ASCII text for transmission through e-mail.

Modem

A modem (modulator/demodulator) converts digital computer signals into analog signals as used in telephone equipment. The data is sent across the telephone lines and converted back to digital signals by another modem at the destination node.
Using dial-up modems, a remote client can gain access to a network through the telephone line. Remote client users can gain access to the network resources just as if they were physically connected to the LAN. SOCKETS supports the PPP, SLIP and CSLIP protocols.

MSS (maximum segment size)

The largest segment allowed for communicating across a TCP/IP connection.

MTU (maximum transmission unit)

The largest amount of data that can be transferred across a given physical network.

Multicast

A technique that allows copies of a single packet to be passes to a selected subset of all possible destinations.

Nagle Algorithm

This algorithm states that under some circumstances, there will be a waiting period of 200 ms before data is sent over a connection.. The following are the specific rules used by the Nagle Algorithm in deciding when to send data:

- If a packet is equal or larger than the segment size (or MTU), and the TCP window is not full, send an MTU size buffer immediately
- If the interface is idle, or the TCP_NODELAY flag is set, and the TCP window is not full, send the buffer immediately.
- If there is less than ½ of the TCP window in outstanding data, send the buffer immediately.
- If sending less than a segment size buffer, and if more than ½ the TCP window is outstanding, and TCP_NODELAY is not set, wait up to 200 msec for more data before sending the buffer.

For more information please see RFC-896, "Congestion Control in IP/TCP"

Nagle Heuristic

See Nagle Algorithm.

Packet

Used loosely to refer to any small block of data sent across a packet switching network.

Packet Driver

Local area network software that divides data into packets for sending on the network, and reassembles the data into its original form when it arrives at its destination.

PCMCIA

Personal Computer Memory Card Interface Association. PCMCIA is a group that defined the standard for a credit-card size card that may act as a memory RAMDISK, ROMDISK, or FLASHDISK. These cards are commonly referred to as PC cards.

POST

Power On Self Test – a test performed by the BIOS that checks the computer hardware for problems before fully initializing the computer.

PPP (Point-to-Point Protocol)

A protocol for framing IP when sending across a serial line.

RAM disk

A disk drive that uses RAM for the media in place of the usual rotating disk drive.

RFC (Request for Comment)

The name of a series of notes that contain surveys, measurements, ideas, techniques, and observations, as well as proposed and accepted TCP/IP protocol standards.

RIP (Routing Information Protocol)

A protocol used to propagate routing information inside an autonomous system.

ROM-DOS

Datalight operating system that can be placed in and execute from within a ROM.

ROM disk

A disk drive that uses ROM for the media in place of the usual rotating disk drive.

ROM scan

The scanning of the ROM area for BIOS extensions performed by the BIOS at initialization time.

ROM

Read Only Memory. This is memory that is not changeable once placed in a computer.

Router

A special purpose, dedicated computer that attaches to two or more networks and forwards packets from one to the other.

RTT (round-trip time)

A measure of delay between two hosts.

Shell

The Shell is the command interpreter, usually COMMAND.COM. The shell takes text commands and calls the DOS kernel to implement them.

SLIP (Serial Line Internet Protocol)

A framing protocol used to send IP across a serial line. SLIP is popular when sending IP over dialup phone lines.

SMTP (Simple Mail Transfer Protocol)

The TCP/IP standard protocol for transferring electronic mail messages from one machine to another.

System disk

See Bootable disk.

TCP (Transmission Control Protocol)

The TCP/IP standard transport level protocol that provides the reliable, full duplex, stream service on which many application protocols depend.

TTL (time-to-live)

A technique used in best-effort delivery systems to avoid endlessly looping packets.

UDP (User Datagram Protocol)

The TCP/IP standard protocol that allows an application program on one machine to send a datagram to an application program on another.

WWW (World Wide Web)

The large-scale information service that allows a user to browse information. WWW offers a hypermedia system that can store information as text, graphics, audio, etc.

Index