CUCCA

Columbia University Center for Computing Activities

DECSYSTEM-20 Pocket Guide

November 1982

• Introduction

The DECSYSTEM-20 is a timesharing computer system built by Digital Equipment Corporation (DEC). The Columbia University Computer Center has four DEC-20s, called CU20A, CU20B, CU20C, and CU20D. The DEC-20 is controlled by an *operating system* called TOPS-20 consisting of the *Monitor* program (which allocates resources, controls devices), and the *Exec* program, through which you communicate with the monitor at your terminal. The Exec types "@" (its *prompt*) on the left margin as a signal that it expects you to type a *command*.

A command is either a self-contained function of the Exec, like copying a file or listing the users who are logged in, or else the name of a system program, which the Exec runs for you, and with which you "talk" until it halts and returns control to the Exec. Programs commonly used at Columbia include the text editors EMACS and OTTO, the electronic mail programs MM and BBOARD, and programming languages like PASCAL, LISP, FORTRAN, and BASIC.

Upper and lower case letters may be used interchangeably in TOPS-20 commands and file specifications.

• Special Characters

Certain special keyboard characters are used in conjunction with TOPS-20 commands.

> The notation ^*x* is used for *control characters*; it means hold down the key marked CTRL and press *x*, where *x* is any letter. ^A is called *Control-A*, and is sometimes also written ↑A, C-A, CTRL-A, or CTRL/A.

CR (CARRIAGE RETURN, RETURN, or RET) "enters" commands and data lines; always abbreviated CR in this document. CR is usually a large key located above the right SHIFT key. Commands have no effect until they are entered with CR.

▸ *Command-Editing Characters*

Use the following special characters to correct typing errors in a command or data line *before* pressing CR to enter it:

DEL (DELETE, RUBOUT) deletes the most recently typed character. Can be used repeatedly to delete backwards toward the beginning of the line.

^U Deletes the current line.
^W Deletes the previous "word".
^R Retypes the current line, show effects of any editing.

Command Retry: If a command has syntax errors, the Exec responds with an error message. If the *next* character typed is ^H, the correct part of the command will be redisplayed, and you can continue from there.

▸ *Help and Recognition Characters*

Question Mark ("?"), typed at almost any time, lists the commands or options that are possible at that point.

ESC (ESCAPE or ALTMODE) invokes "recognition" – a partially typed command or filename is filled out if unambiguous (if not, you'll hear a beep) and you are guided, by a phrase in parentheses, for any required additional information. The ESC key is usually located on the upper left part of the keyboard.

> Use ESC and ? *all the time* until you're thoroughly familiar with how they work. This is the fastest way to learn how to use TOPS-20.

▸ *Other Important Control Characters*

^C CTRL-C is the universal *interrupt* character; typed once or twice in succession, it should interrupt any program or Exec command and return to Exec command level.

^H Usually equivalent to DEL. Most terminals also have a BACKSPACE (or BS) key, which is the same as ^H.

^F Recognize field of command or file specification.
^L Formfeed or clear screen.
^I Horizontal tab.
^O 1st ^O discards terminal output; 2nd ^O resumes it.
^T "Probe" system or program status.
^V Quote special characters in filenames.
^Z "End-Of-File" on textual input from terminal.
^S^Q Suspend/Continue output; see section on terminals.

Note that some programs may define their own meanings for control characters. Type *help commands* to learn about how to type commands to TOPS-20.

• How to Log In

Public-access computer terminals can be found in many places on campus, including the Computer Center, the Engineering School, and various dormitories, libraries, and departments. Dialup access is also available.

Terminals are connected to the DEC-20s through a switching device, the Gandalf PACX, that allows each campus terminal to select any computer at CUCCA. To log in, you must first set your terminal up correctly. If you don't know how, consult the *Terminal and Plotter User Manual*, or ask somebody nearby. The procedure for connecting to a DEC-20 and logging in is:

1. Select a Computer. Tell the PACX which DEC-20 you want:

▸ *From a campus PACX terminal:*

Set your terminal to 4800 baud or slower, FULL DUPLEX, and ON LINE. Ensure that your blue Gandalf LDS-125 PACX box is OFF (toggle switch DOWN). Set the thumbwheels as follows:

CU20A	CU20B	CU20C	CU20D
12	14	15	16

Turn the box ON (toggle switch UP). If the READY light comes on, proceed to step **2**. Otherwise the DISC light comes on; you can:

- Wait a minute, then turn the PACX box OFF and ON again. Repeat until READY comes on.
- If repeated attempts fail because there are no free lines to the desired machine, you can *queue* yourself to be connected as follows: Set the thumbwheels to 10; turn the box OFF and back ON; wait for READY light; type a CR; in response to "enter class" type one of the numbers from the table; if you are asked, "do you wish to queue", reply "y". If the systems (and the PACX) are very busy, the queue might be quite long. if you don't want to wait, either reply "n" to the queue question, or simply turn the box OFF.

▸ *From a dialup PACX terminal:*

Set your terminal to one of the speeds shown below, FULL DUPLEX, ON LINE. Dial one of the following numbers:

280-4911	–	4919	(110/300 baud)
280-5380	–	5389	(110/300 baud)
280-8050	–	8069	(300/1200 baud)

Connect the phone to your terminal and depress CR. The PACX will type "enter class"; you type one of the following single-digit codes, followed by CR:

CU20A	CU20B	CU20C	CU20D
2	4	5	6

If the message "service *xx* start" appears, then proceed; if there are no lines available to the selected system, you will be automatically queued. For complete information, type *help dialup* after logging in.

2. Synchronize Terminal Speed. After a few seconds, the DEC-20 will notice you are connected, and it will attempt to print a greeting like

CU20A [*your terminal type*]
@

Once you see this greeting, you can proceed to step **3** below. Otherwise:

- The DEC-20 guessed your terminal speed incorrectly; the greeting came out garbled, something like

  ~~~~'''xxx''''''''???xxxx

  Push the BREAK key and the Exec will print its greeting again at another speed. Watch the TxD (transmit) and RxD (receive) lights to be sure the connection is working. Press BREAK every 5 or 10 seconds until you see an intelligible greeting, then proceed to step **3**.

- The DEC-20 is *down* (not running). Nothing will appear on your terminal. Allow at least one minute before giving up in case the system is very slow.

3. Log in. In response to the "@" prompt, type the LOGIN command as shown:

```
CU20A [HP2621]
@login id password
```

You type the part that's underlined: *id* is your DEC-20 user ID, usually of the form *course.yourname* or *dept.yourname*, and *password* is your own password, which does not appear on the screen when you type it. As part of the login process, you will have the opportunity to read any new system or class messages. If you see a message like

```
7-Oct-82 SY.FDC, Holiday Schedule
--175 chars More?--
```

you should type a question mark to find out how to read or skip the message (or just press CR to read it). If you skip a message, you can come back and read it later with *BBoard*. Login is complete when you see the next Exec prompt "@".

PROBLEMS: If you have trouble logging in and you suspect PACX or data communication problems, call the Data Communications Group at 280-3100 or, if you have logged in, send mail via MM (see below) to TTY-PROBLEMS.

IMPORTANT: Change your password often to prevent unauthorized use of your ID; type *help password* after logging in to learn how.

FUNDED USERS: You should have received a handout describing special facilities and procedures. Please type *help funded* after you first log in.

STUDENTS: If you are a student with a course ID, your access to the system is restricted in certain ways. Type *help omega* after you first log in.

REATTACHING TO DETACHED JOBS: If you become disconnected from the computer without logging out, your job will be "detached." To get back to your job without losing any work, follow the normal login procedure, except use the ATTACH command instead of LOGIN, as in this example (the part you type is underlined):

```
CU20C [VT100]
@attach comsw3001-2x.a-student
Password: password
```

Press CR after your ID; the system will prompt you for your password, which will not echo. Reattach promptly; most detached jobs disappear after 5 or 10 minutes.

• How to Log Out

Always terminate your session by logging out. To log out, simply type *logout*. If you see the message "[confirm]", type CR to confirm the logout command, or ^C to change your mind. After you log out, the system will print a 2- or 3-line message summarizing your session. If you're logged in from a PACX box, wait for the READY light to go off (and DISC to come on), then switch it off. If you're dialed in, wait for your carrier light to go off before disconnecting your phone or hanging up.

• Terminals

Computer terminals come in different varieties; some print on paper ("hardcopy"), some on a screen ("CRT"); a terminal may or may not have certain features like hardware tabs or built-in editing functions; terminals may have different widths (characters per line) or lengths (lines per screen or page). TOPS-20 takes advantage of many terminal hardware features if you specify the terminal characteristics correctly. A collection of *command files* is available to set each kind of terminal up correctly; each time you log in you should execute the command file for your terminal by typing *take ter:xxx*, where *xxx* is the name of the terminal, e.g. HP, VT100, Concept, LA36. This is especially important if the system guessed your terminal type incorrectly when you logged in; e.g. the first thing it typed was "[HP2621]" and you are sitting at a VT101. To see what terminal setup files are available, type *dir ter:*.cmd*.

If you have executed a command file for a video terminal, or have issued the *terminal pause (on) end-of-page* command, the computer will always beep and stop typing whenever it has filled up your screen. This gives you time to read each screenful before it scrolls away. The following characters control this feature:

- ^Q Continue output. Whenever you suspect that the computer isn't working, always try typing ^Q first.
- ^S Stop typing. Suspends output until ^Q is typed.
- ^A When logged in over DECnet, ^A takes the place of both ^Q and ^S.

For further information, type *help terminal* and consult the *Terminal and Plotter User Manual*.

• How to Get Help

Question Mark: At any point in an Exec command – and in many programs – a question mark ("?") will produce a brief message.

The HELP command: Once logged in, you can get more detailed information about a command or program by typing
  ~~~~

a HELP command, e.g. *help login*. Just type *help* for an introduction to the HELP command.

Other facilities are also available for obtaining information:

- *The INFORMATION Command:* tells the status of various system, program, or job parameters. Type *help information* for details.
- *Documentation Files:* Longer documents, like manuals, are available in DOC: or INFO: via *type, edit* or other file-access commands.
- *XINFO:* Structured tutorials on various topics, like programming languages, text processing. Just type *xinfo* to get started.
- Most programs have *built-in* help. Try typing *help, ?,* or */h* in response to the program's prompt.

• User Intercommunication

The following programs and Exec commands are available for linking terminals, sending messages, or electronic mail.

SYSTAT	List active jobs, terminals, programs, user IDs.
FINGER	Like SYSTAT, but also shows human name, campus location, "plan," and other data.
TALK	Lets users view each others' sessions.
ADVISE	Type commands to another user's terminal.
SEND	Send a message to another user's terminal.
REFUSE	Refuse *talk, advise,* or *send* links.
RECEIVE	Accept *talk, advise,* or *send* links. Only RECEIVE ADVICE from a staff member or your instructor or course TA.
BREAK	Break existing TALK (but *not* ADVISE) links.
MM	Mail Manager: electronic mail.
BBOARD	Electronic bulletin board.

Type *help* on any of these topics for further information. Use MM to report complaints and comments to CUCCA staff; send your message to REMARKS.

• The TOPS-20 File System

TOPS-20 file specifications (or *filespecs*) are of the form:

dev:<directory>name.type.gen

in which each part is a "field": *dev:* denotes a physical or logical device, *<directory>* denotes an area on the device (usually a user ID), *name* is a file name, *type* is a file type or "extension", and *gen* is a generation, or version, number. The directory, file name, and file type may each be up to 39 characters long, though the type is usually 3 characters. A file's generation number increases each time the file is saved; a selected number of generations of each file can be retained.

Example:

```
PS:<DOCUMENTATION>COMND.DOC.2
```

The file is named COMND, of type DOC (a document), generation 2, in the directory called <DOCUMENTATION> on the Public Structure (PS:).

Most fields of a filespec have defaults and need not normally be typed. Defaults are explained below.

▸ *Device*

The device field specifies a physical device, a disk structure, or a *logical name,* which in turn can be composed of devices, directories, filespecs, in any combination to form a search list. The device field is terminated by a single colon. Some important device names and *system-wide logical names* are:

SYS:	Where system programs are found.
DSK:	Your connected directory.
PS:	The *public structure,* the disk structure which contains your user ID.
DOC:	Where to find long documentation files.
HLP:	Where to find short help files.
TER:	Where to find terminal info and command files.
TEST:	New versions of programs that are being tested.
OLD:	Old versions of system programs.
AID:	Conversion aids, especially for magnetic tape.
TTY:	Your terminal.

EDITOR: Specifies which text editor you use.

You can define your own *job-wide logical names* with the *define* command; you can find out what logical names are already defined with the *info logical-names* command. Type *help define* for further information.

▸ *Directory*

Your directory is the area on the disk in which you may store files. A directory name is always enclosed in angle brackets, e.g. <CS3.U-CODE>. Your directory has a *storage quota,* a maximum number of *pages* you may keep. A page is the minimum unit of disk storage, 512 36-bit words, or 2560 7-bit characters. Type *info directory* or *info disk* to find out your disk storage quota and related information. The *directory* command will list the files in your directory.

Your *user name* is the same as your directory name, but without the brackets. A user name is used to refer to a user, e.g. when logging in or as a mail or message address; a directory name is used to denote the area where the user's files are stored. Examples:

```
@login a-person       @directory <a-person>
@talk (to) a-person   @type ps:<a-person>foo.txt
```

Your *connected directory* is one in which you are allowed to store files, and which is assumed whenever you omit the directory field from a filespec. This is normally your login directory, but may be changed to another via the *connect* command.

▸ *File Types*

Some conventional types are listed below. If you use these as

indicated, many system features will work for you automatically. For instance, if you call your Pascal program FOO.PAS, then the *compile* command will know to invoke the Pascal compiler on it. Conventional file types for programming languages are listed later. Other common types include:

.TXT	A text file intended to be read directly by humans.
.REL	A relocatable file, i.e. a compiled but not yet loaded program, to be processed by the system loader.
.EXE	An executable program, like those in SYS:.
.CMD	Commands for the Exec or some other program.
.CTL	A batch control file.
.LST	A file to be printed, then automatically deleted.
.DAT	A Fortran data file, carriage control in column 1.
.DOC	A long documentation file, e.g. a manual.
.HLP	A short help file, such as those displayed by the *help* command.
.INIT	An initialization file for some program, like MM.

Type *help extensions* for a more complete list.

▸ *Defaults*

If certain fields are left out when typing filespecs, defaults are supplied as follows:

dev:	Usually DSK:.
<directory>	Your connected directory.
name	No default; can never be omitted.
type	Depends on context.
gen	0 (zero), "most recent" (for existing files) or "next highest" (for new files).

▸ *Wildcards*

The characters "*" and "%", when included in a filespec, match any sequence of characters or any single character, respectively; these are known as *wildcards*. Most Exec commands that operate on files will accept wildcards. For instance, "dir %.m*" lists the names of all your files with a one–character name and a type that starts with "m"; "delete *.pas" deletes all your Pascal programs.

▸ *TOPS-10*

Some languages and programs come from TOPS-10, a relative of TOPS-20, and require file specifications to be in a different format. Type *help TOPS-10* for further information.

▸ *File Protection*

The TOPS-20 file system is designed to allow files and directories to be guarded by 6-digit protection codes (e.g. 770000) that regulate access, e.g. to permit or deny reading, writing, execution, or directory listing of a file. Type *help protection* for details. The following Exec commands are related to file accessibility:

```
SET FILE PROTECTION
SET DIRECTORY PROTECTION, SET DIRECTORY PASSWORD
SET DIRECTORY FILE-PROTECTION-DEFAULT
```

INFO DIRECTORY	Shows the directory's protections.
VDIR	Shows protections of individual files.
CONNECT	Change working directory. Asks for password.
ACCESS	Change access rights. Asks for password.

▸ *File Management* – Exec Commands:

COPY	Copy files.
RENAME	Rename or move files.
APPEND	Append file(s) to another file.
DELETE	Mark files for deletion.
UNDELETE	Remove the deletion mark.
EXPUNGE	Permanently erase *all* deleted files from disk.
DIRECTORY	List names of files. Many options available.
QD	List names of deleted files not yet expunged.
TYPE	List contents of files at your terminal.
PRINT	List contents of files on a printer.
EDIT	Create or modify a file with a text editor.
SET FILE	Change various file attributes.

Type *help copy, help rename,* etc, for further info; *help print* will explain what printers are available and how to use them.

▸ *File Management* – Programs:

SORT	Sort or merge files of various formats.
FILCOM, SRCCOM	Compare files, produce list of differences.
REV	Review files, clean out a directory.
PDIR	Check protection of files.
LASTN	Display the last *n* lines of a file.
FILTER, FIND, XSEARCH	Search file(s) for strings.

▸ *Disk Quotas*

Whenever you create a new version of a file, an old version (*generation*) automatically becomes *deleted*. The deleted version still takes up space in your directory. As deleted versions pile up, your disk quota is reached. TOPS-20 will not let you exceed your disk quota; any program (such as an editor or compiler) that attempts to do so will fail, and will normally print an error message like

```
?Quota exceeded or disk full
```

and halt. At this point you can issue the *expunge* command to permanently erase and remove all deleted files, to make space for new ones, and then *continue* your program. Before expunging, you can issue the *qd* command to see if there are any deleted files you do *not* wish to expunge; if there are, you should first *undelete* them.

If you need extra temporary space in which to work, you may allocate a *stall* during your session. Type *help stall* for further information.

• Programming

The following high-level programming languages are available. Conventional filetypes are shown in parens. Most have an associated library found on the logical device corresponding

to the conventional filetype, e.g. FOR: for Fortran.

Algol-60	(ALG)	Fortran	(FOR)	LISP	(LSP)
Algol-68	(A68)	Ratfor	(RAT)	PPL	(PPL)
Sail	(SAI)	SITGO	(STG)	BCPL	(BCP)
MainSail	(MSA)	Basic	(B20)	C	(C)
Simula	(SIM)	Snobol	(SNO)	CPL	(CPL)
Pascal	(PAS)	APLSF	(APL)	Bliss10	(B10)

Also, there are various assemblers:

Macro	(MAC)	Midas	(MID)	Fail	(FAI)

and cross compilers: BLIS11, MACY11 for the PDP-11; for various microcomputers, look in PS:<MICROS>.

Type *help programming* for further general information, *help* for a particular language, e.g. *help simula*.

▸ *Exec Commands*

The following Exec commands are for programmers. The first four are the *load-class commands*, which have special properties: when issued repeatedly, they remember their original arguments; editors can issue them to the Exec upon exit; default switches can be set for them, etc; type *help load-class-commands* to learn more about them.

COMPILE Translate source programs into loadable relocatable binary (.REL) form. Do nothing if .REL is newer than corresponding source.

LOAD Link and load into memory for saving or execution, compiling any module whose source is newer than corresponding .REL.

EXECUTE Load, then begin execution.

DEBUG Load with appropriate debugger, start debugger.

SAVE Save a loaded program in executable form on disk as an .EXE file.

GET Get a program into memory but don't start it.

START Start a program which is already in memory.

RUN Equivalent to GET followed by START.

name A program in SYS: can be run by typing its name.

R Equivalent to RUN SYS:*name*.

DDT Debug a loaded program at assembly language level. Source level debugging is also available for high-level languages, e.g. PASDDT for Pascal, FORDDT for Fortran, SNODDT for SNOBOL.

CONTINUE Resume execution of an interrupted program.

SET DEFAULT COMPILE-SWITCHES Allows default switches to be set for each compiler.

^C^C Two control-C's should interrupt any program.

Type *help* for any of the commands listed above for further information. Also, type *help set* and *help info* to see options of these commands that apply to programming.

Some of the facilities described in the following sections are not available on all systems, or to all users on a given system. Consult the *Guide to Facilities* for details.

• Text Processing

Text editors are used to prepare programs, data, documents, or input to text formatters.

▸ *Text Editors*

EDIT The standard DEC line-oriented editor.

OTTO A helpful line editor for beginners.

EMACS A very powerful video display editor.

Other editors, including TECO and TV, exist but aren't recommended unless you know them already. Type *help editors* for general info, or *help* for a particular editor.

▸ *Text Formatters and Printing Aids*

RUNOFF Text formatter found on most DEC systems. A newer version called DSR is also available.

SCRIBE A powerful document preparation system.

TEX A computer typesetting system. This document was prepared on the IMAGEN IMPRINT-10 laser printer using TEX.

SPELL Check and/or correct spelling.

DIABLO Print Scribe .POD output on Diablo terminals.

EMACS (includes text formatting features sufficient for many documents.)

• Networks

Computer networks provide services between machines: electronic mail, file transfer, terminal connection, shared printers, remote batch job submission. Type *help* on any of the following topics for details:

DECnet Communication among DEC computers at Columbia and at some remote sites.

BITnet An IBM-based network to which DECnet has mail access.

IBM Batch-mode communication between Columbia's IBM and DEC computers.

Kermit Terminal connection, error-free file transfer via terminal lines. Used between microcomputers and the central IBM and DEC systems.

DX Terminal connection and file transfer between the DEC-20 and DEC word processing systems (WS78, DECmate).

• Miscellaneous

Type *help* for any of the following topics:

Balance	Inquire about your DEC-20 account balance.
Batch	Running jobs in the background.
Charges	Rates for CPU time, connect time, etc.
Crash	What happens when the system "crashes".
Fork	Process structure and manipulation.
Games	CUCCA's policy on computer games.
Graphics	What graphics facilities are available.
Journal	How to record your timesharing session.
Omega	Regulation of student access.
Packages	Program packages: scientific, statistical, etc.
Password	How to change your password.
PCL	Programmable Command Language.
Push	Creating a new Exec environment without destroying your current one.
Schedule	DEC-20 operating and backup schedule.
Stall	How to get temporary working space.
Take	How to use Exec command files.
Tapes	How to use magnetic tapes.

• References

The following DEC manuals are available in the reference areas:

Getting Started With TOPS-20. A brief introduction to using the DEC-20.

TOPS-20 User's Guide. A more detailed overview, concentrating on how to communicate with the system, create and run programs, etc.

TOPS-20 Commands Reference Manual. Complete description of all standard Exec commands.

TOPS-10/TOPS-20 Batch Reference Manual. Complete guide to use of the batch system.

These manuals will refer you to any further DEC manuals you might need. A list of DEC manuals can be found in the file DOC:DEC-MANUALS.DOC. In addition, the following publications are available from CUCCA:

Guide to Facilities. Describes CUCCA hardware, software, policies. Lists support levels for software.

Terminal and Plotter User Manual. Instructions for setting up and using terminals.

Newsletter. Published biweekly during the academic year.

Course Brochure. Describes current CUCCA courses for users of DEC (and IBM) systems.

Documentation Bibliography. List of CUCCA publications.

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