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Information on IBM 3090

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Information
On IBM 3090

Compiled
by

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Information on IBM 3090

The purpose of this note is to convey some useful information regarding the IBM 3090 Computer in CSCF. Accounts can now be obtained from Tony Natoli in Applied Math Department. You need to know your (two digits) Department code, when applying for accounts. For example DD is the code for the Accelerator Development Department and AD is the code for AGS department etc. An allocation of disk space has been made for all the Departments, which is small, "partly because BNL has not bought enough and partly because Applied Math does not want to allocate all of it until they understand the system better". New accounts are given in CYLINDERS . You get a 1-3 cylinder (1cylinder = .6 Mbytes 191 or A disk), which your Department or Group Czar can increase within the limits of the initial allocation (as approved by your Department)

Disk space is presently limited. Fortunately there are plans for significant increase in the future; so, do not expect large personal disk space at this time. SCRATCH disk space is available; and can be accessed either with GIME (retention period as long as you are on) or SPACE (retention period of 1 day; which may be extended to more days "soon").

MANUALS

VM/CMS, the IBM operating system, has been extensively modified by SLAC but still is not very satisfactory. Nevertheless, it does give interactive access to a very fast computer. There are extensive HELP and AID files available on-line. If you are in trouble try HELP TASK_NAME or AID TASK_NAME. the SLAC utility AID will frequently offer you a list of possible categories to search with the HELP command. A list of essential manuals is given below:

CMS Primer: A very elementary introduction but useful for getting started; can be obtained from Applied Math Department (Manual Library).

System Product Editor User's Guide: An elementary introduction to XEDIT, the full screen editor.

CMS User's Guide: "This is one of the worst manuals ever seen, but it contains essential information. Skip Chapters 8 - 11."* Chapter 12 is supplanted by the SLAC batch system; use HELP BATCH to find out about it.

Contributions keys:

* = Physics Dept. Computer Committee (M. Murtagh, W. Love, F. Paige)

= H. Berry and others

VS Fortran Version 2 Programming Guide: This describes IBM Fortran, including the extensions to take advantage of the vector facility. Be sure to get Release 1.1. There is also a short memo on optimizing vector code.

VS Fortran Version 2 Interactive Debug Guide and Reference: This describes the debugger. You must include TSOLIB in your GLOBAL TXTLIB to use it.

VS System Product Interpreter User's Guide: REXX programming manual. Essential for budding EXECutives.

VM-CMS Tutorial: AMD version of the CERN IBM tutorial. This should be available soon, and can be obtained from Applied Math Department.

USEFUL HINTS, EXECs AND KEYPAD INFORMATIONS*

Although it may take a considerable effort to learn how to use the machine well. There are number of problems and solutions already discovered by some of the users which is of general interest. Based on the information from Applied Math Department, H. Berry, Physics Department Computer Committee,* W. Lově, M. Murtagh, F. Paige, and others note the following useful Hints, Execs and information on using various terminals (use of the VT100 interface, even on a VT220 terminal is recommended):

1. "The VM/CMS system has a pretty primitive organization of disk space. The picture is rather like a bunch of boxes of floppies on a shelf with no tree-like directory structure at all, just a letter on each floppy. The CERN VM/CMS tutorial says "files may be grouped by giving them a common file type". Don't you believe it. File type is the same thing as the "extension" on the VAX except its worse; the compiler won't compile any file unless it has a file type of FORTRAN for example, and thus you have to type seven characters instead of three. There is also a suggestion that you "organize your work by putting all your FORTRAN files on one disk, all your EXECs on another", etc. That may be your idea of organization. Possible options are that you can put different projects on different minidisks. i. e. your subdirectories are named A, B, D etc. which gives you in the neighborhood of 15 or 20 "pockets" after the system has taken its share. The filemode numbers 1, 2 and 5 seem to be equivalent and undefined so that gives you another threefold separation if you can figure out how to use it wisely. Another course is to get a different virtual machine for each project by becoming many different users with mnemonic names. This is clearly antisocial and may become very clumsy since the logon procedure is so tedious. In either case each of your different "directories" costs at least one cylinder so we'll need to buy more disks, which is maybe IBM's motivation in the first place."*

2. Debugger will not function if any unsatisfied loader stuff. If the TSOLIB TXTLIB is not GLOBAL at DEBUG time ,mysterious IKJPUTL routine is said to be missing, i. e. apparently the debugger actually uses the loader again? See an ADDLIB EXEC at the end of this section to extend the library list (IBM figures you want to type the whole list over to make any changes).

3. When the LOAD fails with Table overflow it is time to get more loader table space by Q LDRTBLS to see what you have and then SET LDRTBLS $n + 1$.

4. If a multi-routine FORTRAN file is compiled and installed in a "TEXT" library (TXTLIB) it gets put in as one indivisible module. If you want to be able to load routines independently they have to be compiled as separate operations.

5. Most of the conversion from VAX to IBM involved:

a. Tabs were not being passed correctly; had to convert to spaces first.

b. .AND. and .OR. used for bit masking operations between integer variables have to be converted to use IAND and IOR functions, which, incredibly enough, must have INTEGER*4 arguments only on IBM.

c. FORMAT code for OCTAL is not available on IBM. In many cases Hexadecimal makes a reasonable replacement.

d. \$ used at the end of FORMAT statements output to the terminal to suppress the carriage return must be moved to the first column where they still work on the VAX and are ignored by the IBM. On the IBM all input appears in the "Input zone" on the bottom line.

6. Transfer of files via the PC can be done by typing the file while the PC terminal emulator captures the typed lines. This inserts extra blank lines after long lines in parameter files. These have to be removed before reading the file with PARFRW etc. Now that ftp is available between the cluster and the IBM, "moving files should be duck soup". However the default is 80 character ASCII and a SITESET command is necessary for files with longer lines. Telnet can be used to log on to the cluster and fetch the files from BNLDAG or BNLHEP but at the moment it doesn't do VT100 keys very well; it gets all flustered.

7. FORTRAN I/O discrepancies. If you try to read into a character string from a file which doesn't have enough characters on the line, IBM will crash rather than merely supply blanks the way the VAX would. This means in effect that the MPS parameter files have to be copied to F (fixed length) record type files with some length like 84 characters.

It seemd, one has to define the OUTPUT file as F (fixed length) and 135 char. wide, thus wasting a lot of space but now PRSMY works. It is suggested that V format and LRECL=135 IS ASKING ONLY FOR 131 WRITABLE CHARACTERS since one word is needed for V format word count.

8. BATCH problems. A popular technique for dealing with the minidisk residency problem is to swap the "A" designation around among disks. Be aware that the BATCH system

does not see these swappings and always attaches the "A" disk you were born with. Thus if your EXEC is on any of your other disks you can't BATCH it. All the other files can be handled by putting a "GIME" in the EXEC but the job deck itself must be on the primordial A. PEEK is a trap for the unwary, by the way. It lets you look at the FRONT of the files in your reader but the END_OF_FILE it shows you is a fake.

Note that files left in your reader must be DISCARDED rather than ERASED. The easy way to do this is to type DISCARD in the prefix area. An amusing bug is discovered if the file name starts with a "D" and thus the last D in DISCARD is typed on top of an existing "D". The DISCARD command is then not recognized. If you type DISCARD followed by SPACE it will work.

9. Other Disk problems.

a. SPACE will issue temporary disks which can be recovered if they haven't been assigned to someone else. You can hold on to these disks a little longer by DISCONNECTING instead of logging out. However, it has happened that SPACE has taken back the disk while a user was disconnected and on logging back in the user found that Q DISK shows the disk as ACCESSED, Q V DASH shows the disk as linked, but CP knows there is no such disk available for this user.

b. DIRECT access files (the MPS error messages) have to have the XTENT parameter specified (FILEDEF) on every use. Apparently the system can't find out for itself how many records are allowed for the file.

c. New permanent disks have to be formatted by the user between the LINK and the ACCESS. If you forget you just get a device error on trying to access. GIME does this for you.

d. There is another pitfall generated by swapping disks to make a scratch disk your temporary A disk. This moves your profile exec which is usually on your real A disk down in the search list and it can wind up below a disk you've GIME'd from someone else (usually his A disk). Then, when you PROFILE to restore your GLOBAL conditions for example you get his PROFILE EXEC instead of yours. It can get confusing. Maybe everybody should have a microdisk to hold just his PROFILE EXEC and keep all the files anyone might want to borrow on a larger B disk.

e. The famous "group" disk. A disk can be made to be shared among a group of people defined as all who know the write password for the disk. There is a SLAC management tool called INSTALL that eases the operations on that disk, keeps track of who "owns" each file, keeps a history of changes, etc. It merely involves putting a few files on the disk. It has to belong to someone, however and it can be inconvenient for the owner because INSTALL won't let anyone use it who has it attached in R/W mode. Note also that INSTALL says you have to put a MULTI password on the disk for it to work (the knowledge of that password defines the group) and CMS says you can't define a MULTI password unless you

password defines the group) and CMS says you can't define a MULTI password unless you define a WRITE password which requires a READ password. However its bad to define a READ password that is anything except 'ALL' but you find that out later.

ADDITIONAL USEFUL EXEC'S:

ADDLIB: Add a library to a GLOBAL list. If the library is already in the list, then it is deleted. Usage:

ADDLIB <name> {TXTLIB | LOADLIB | MACLIB}

The new library is placed first so that it is first in the search order.

AFFON: Make a <name> AFFON file for use with the debugger with all subroutines turned off by default. Fortran library subroutines are not included -- hopefully they do not contain bugs. Usage:

AFFON <name>

To turn on debugging for a subroutine, edit the <name> AFFON file and delete the * in column 1 for that subroutine. It is essential to debug only a few routines to obtain reasonable efficiency. Note that one must specify

GLOBAL TXTLIB TSOLIB ...

to use the debugger.

FTNLIB: Make a sensible TXTLIB from a Fortran source so that only routines actually needed are loaded. The IBM default is to load all the subroutines from a file if one is used(!). Usage:

FTNLIB <Fortranname> <Libraryname> (<options>)

where <options> are any options for FORTV2 except those related to printing, which is suppressed. If <Libraryname> TXTLIB exists, then the routines from <Fortranname> FORTRAN are added to it. This EXEC splits <Fortranname> FORTRAN into individual routines by looking for END statements and compiles each separately.

GETFM: Get the file mode for a file and stack it LIFO. If more than one file with <fname> <ftype> exists, the first is found. Usage:

GETFM <fname> <ftype>

If the file does not exist, then the nonzero RC from LISTFILE is returned and nothing is stacked.

SCRATCH: Make a temporary scratch disk if one does not exist and flag it with a file <username> <flag>. Usage:

SCRATCH <ncyl> <flag>

where <ncyl> is the desired number of cylinders (1 cylinder = .6 MB). The <flag> should be DISKnnn, DISKSCR,.... A file <username> DISK191 must exist. Flagging disks with files in this manner seems to be the best way to avoid errors (especially in EXEC's) arising from the fact that the FMODE assigned to a disk can change.

COMMUNICATIONS

1. BITNET This is now available on the IBM. The node to use is BNLVMA.

2. TCPIP is the protocol between the VAX CLUSTER and the IBM. It can transfer files in both directions. There are on-line HELP files available under HELP FTP or HELP TELNET. In all cases enter LOCAL_FILE in the form FILENAME.EXT. To use it:

VAX → IBM

LOG onto VAX CLUSTER (any node)

FTP BNLVMA↵

ftp> It will ask you to LOG onto the IBM

—

—

SEND LOCAL_FILENAME REMOTE_FILENAME

—

—

ftp>QUIT↵ to leave FTP

DO NOT DO *ctrl/Y* OR YOU WILL BE LEFT LOGGED ONTO THE IBM

If you do you must call the computer operators and ask them to

FORCE you out of the IBM.

IBM → VAX

FTP BNLCL1(2,3,4)↵

it will ask you to log onto the CLUSTER

ftp:

PUT LOCAL_FILE <REMOTE_FILE>←

ftp:

QUIT←

TERMINALS AND KEY DEFINITIONS

The IBM operating system and the full screen editor XEDIT assume that the user has an IBM 3270 series terminal. Gandalf class 71 provides emulation of such terminals on DEC VT100 terminals and equivalents. The VT100 must be set for 7 bits, even parity, and full duplex. This can be done both on DEC VT220 and VT240 terminals and in PC INTERCOM on the IBM PC. It is preferable to use a VT220 in its VT100 mode because the key layout is more logical.

The following chart shows the key definitions for the VT100 keypad. The alternate function on the second line is obtained by first pressing KP0.

pf1 PF1 PF13	pf2 PF2 PF14	pf3 PF3 PF15	pf4 PA1
kp7 PF4 PF16	kp8 PF5 PF17	kp9 PF6 PF18	kp- PA2
kp4 PF7 PF19	kp5 PF8 PF20	kp6 PF9 PF21	kp, PA3
kp1 PF10 PF22	kp2 PF11 PF23	kp3 PF12 PF24	enter CLEAR
kp0 Alternate PF Keys	kp. INS		

The following chart shows the PF keys defined for use in CMS by SETKEYS EXEC on PAIGE minidisk 191. All of these commands are immediate except for RETRIEVE BACKWARD and RETRIEVE FORWARD, which just display the command.

pf1 HELP	pf2 BATCH Q M	pf3 BATCH Q *	pf4 CP/VM
kp7 FILELIST	kp8 RDRLIST	kp9 Q DISK	kp- PA2
kp4 RETRIEVE B	kp5 RETRIEVE F	kp6 Q DASD	kp, PA3
kp1 HT	kp2 HI	kp3 HX	enter CLEAR
kp0 Alternate PF Keys	kp. INS		

The following chart shows the function keys defined for use in XEDIT by PROFILE XEDIT on PAIGE minidisk 191:

pf1 HELP HELPKEYS	pf2 LINEADD RESET	pf3 QUIT SAVE	pf4 PA1
kp7 TABKEY WFIND	kp8 SCHANGES WERASE	kp9 ? TOP	kp- PA2
kp4 BACKWARD HALFUP	kp5 FORWARD HALFDOWN	kp6 = BOTTOM	kp, PA3
kp1 RGTLEFT BOL	kp2 SPLTJOIN EOL	kp3 CURSOR INSHERE	enter CLEAR
kp0 Alternate PF Keys	kp. INS		

Several of these commands are new XEDIT macros which are on minidisk PAIGE 191:

BOL	Beginning of cursor line
EOL	End of cursor line
HALFDOWN	Scroll forward 1/2 page
HALFUP	Scroll backward 1/2 page
HELPKEYS	Display VT100 keypad for XEDIT
INSHERE	Insert after cursor line
WERASE	Erase next word on current line
WFIND	Find next word on current line

The following additional prefix commands from SLAC are defined:

PT [T]	[Block] Put
PD [D]	[Block] Put and delete
G	Get
L [L]	[Block] LOWERCAS
U [U]	[Block] UPPERCAS

Keyboard Definitions for the VT100 Terminal, PC/InterComm & SmarTerm

Control and Cursor Movement Keys

<u>IBM FUNCTION</u>	<u>VT100</u>	<u>PC/InterComm & SmarTerm</u>
Enter	RETURN	
Clear	ENTER ¹	+ ¹
Redisplay	CTRL-V	CTRL-V
Erase EOF ³	ESC DELETE	ESC DEL
Delete Character ³	DELETE	DEL
Toggle Insert Mode	. (period) ¹	. (period) ¹
Field Tab	TAB	
Field Backtab	ESC TAB	ESC
Column Tab	ESC →	ESC →
Column Backtab	ESC ←	ESC ←
Indent	ESC ↑	ESC ↑
Undent	ESC ↓	ESC ↓
PA1	PF4 or ESC , (comma) ² or ESC <	F4 or ESC , (comma) ² or ESC <
PA2	- (hyphen) ¹ or ESC > or ESC . (period) ²	- (hyphen) or ESC > or ESC . (period) ²
PA3	, (comma) ¹ or ESC / (slash) or ESC ? (question mark)	, (comma) ¹ or ESC / (slash) or ESC ? (question mark)
Newline	LINE FEED	CTRL-
Home	BACK-SPACE	←
Cursor Up	↑	↑ or F7
Cursor Down	↓	↓ or F8
Cursor Right	→	→ or F6
Cursor Left	←	← or F5

¹ This key can be found only on the additional numeric keypad on the right side of the VT-100 or the IBM PC.

² This key can be found only on the main keypad. Do not select a similar key on the additional numeric keypad on the right side of the VT-100 (or the IBM PC) keyboard.

³ For the SmarTerm VT100 emulator Erase EOF is ESC CTRL← and Delete Character is CTRL←←.

Program Function Keys

<u>IBM FUNCTIONS</u>	<u>VT100</u>	<u>PC/InterComm & SmarTerm</u>
PF1	ESC 1 ² or PF1	ESC 1 ² or F1
PF2	ESC 2 ² or PF2	ESC 2 ² or F2
PF3	ESC 3 ² or PF3	ESC 3 ² or F3
PF4	ESC 4 ² or 7 ¹	ESC 4 ² or 7 ¹
PF5	ESC 5 ² or 8 ¹	ESC 5 ² or 8 ¹
PF6	ESC 6 ² or 9 ¹	ESC 6 ² or 9 ¹
PF7	ESC 7 ² or 4 ¹	ESC 7 ² or 4 ¹
PF8	ESC 8 ² or 5 ¹	ESC 8 ² or 5 ¹
PF9	ESC 9 ² or 6 ¹	ESC 9 ² or 6 ¹
PF10	ESC 0 ² or 1 ¹	ESC 0 ² or 1 ¹
PF11	ESC - (hyphen) ² or 2 ¹	ESC - (hyphen) ² or 2 ¹
PF12	ESC = or 3 ¹	ESC = or 3 ¹
PF13	0 ¹ PF1 or ESC q ³	0 ¹ F1 or ESC q ³
PF14	0 ¹ PF2 or ESC w ³	0 ¹ F2 or ESC w ³
PF15	0 ¹ PF3 or ESC e ³	0 ¹ F3 or ESC e ³
PF16	0 ¹ 7 ¹ or ESC r ³	0 ¹ 7 ¹ or ESC r ³
PF17	0 ¹ 8 ¹ or ESC t ³	0 ¹ 8 ¹ or ESC t ³
PF18	0 ¹ 9 ¹ or ESC y ³	0 ¹ 9 ¹ or ESC y ³
PF19	0 ¹ 4 ¹ or ESC u ³	0 ¹ 4 ¹ or ESC u ³
PF20	0 ¹ 5 ¹ or ESC i ³	0 ¹ 5 ¹ or ESC i ³
PF21	0 ¹ 6 ¹ or ESC o ³	0 ¹ 6 ¹ or ESC o ³
PF22	0 ¹ 1 ¹ or ESC p ³	0 ¹ 1 ¹ or ESC p ³
PF23	0 ¹ 2 ¹ or ESC _ (underscore)	0 ¹ 2 ¹ or ESC _ (underscore)
PF24	0 ¹ 3 ¹ or ESC +	0 ¹ 3 ¹ or ESC +

Local Reset and Control Functions

<u>IBM FUNCTION</u>	<u>VT100</u>	<u>PC/InterComm</u>
Master Reset (Reinitialize Terminal)	CTRL-G	CTRL-G
Character Error Reset (Clear Parity Error)	CTRL-R	CTRL-R
Keyboard Unlock (IBM Reset Function)	CTRL-T	CTRL-T
Type-ahead Purge	CTRL-X	CTRL-X
Pacing Start	CTRL-S	CTRL-S
Pacing Stop	CTRL-Q	CTRL-Q

- ¹ This key can be found only on the additional numeric keypad on the right side of the VT-100 (or the IBM PC).
- ² This key can be found only on the main keypad. Do not select a similar key on the additional numeric keypad on the right side of the VT-100 keyboard (or the IBM PC).
- ³ This character may be typed in as uppercase or lowercase.

Setup Functions

<u>IBM FUNCTION</u>	<u>VT100</u>	<u>PC/InterComm & SmarTerm</u>
Set Column Tab	ESC ` TAB	ESC ` CTRL-I
Delete Column Tab ³	ESC ` DELETE	ESC ` DEL
Set Left Margin	ESC ` LINE FEED	ESC ` CTRL-
Set Home Line	ESC ` BACKSPACE	ESC ` ←
Delete All Column Tabs, Home Line and Left Margin	ESC ` ENTER ¹	ESC ` + ¹
Improved Null Processing	ESC ` N	ESC ` N
3270 Null Processing	ESC ` n	ESC ` n
Zones Mode On	ESC ` z	ESC ` z
Zones Mode Off	ESC ` Z	ESC ` Z
Reverse Enter/Newline Keys	ESC ` e	ESC ` e
Restore Enter/Newline Keys	ESC ` E	ESC ` E
Reverse Column and Field Tab Keys	ESC ` c	ESC ` c
Restore Column and Field Tab Keys	ESC ` C	ESC ` C
Alpha in Numeric-Only Field	ESC ` v	ESC ` v
3270 Numeric Fields	ESC ` V	ESC ` V
3278 Insert Mode	ESC ` i	ESC ` i
3277 Insert Mode	ESC ` I	ESC ` I
Suppress Pacing	ESC ` P	ESC ` P
Restore Pacing	ESC ` p	ESC ` p
Keyboard Initiated Line Drop	ESC ` ,(period) ²	ESC ` ,(period) ²
Return to ENTER TERMINAL TYPE Message	ESC ` ,(comma) ²	ESC ` ,(comma) ²
Dvorak Keyboard Arrangement	ESC ` q	ESC ` q
Primary Keyboard Arrangement	ESC ` Q	ESC ` Q

¹ This key can be found only on the additional numeric keypad on the right side of the VT-100 (or the IBM PC).

² This key can be found only on the main keypad. Do not select a similar key on the additional numeric keypad on the right side of the VT-100 keyboard.

³ For the SmarTerm VT100 emulator Delete Column Tab is ESC ` CTRL- ←.

Keyboard Definitions for the VT100 Terminal, Hazeltine & PCPlot

Control and Cursor Movement Keys

<u>IBM FUNCTION</u>	<u>Hazeltine</u>	<u>PCPlot¹</u>
Enter	RETURN	↵
Clear	ENTER ²	AF8 or AF10
Redisplay	CTRL-V	CTRL-V
Erase EOF	ESC DEL	ESC DEL
Delete Character	DEL	DEL
Toggle Insert Mode	. (period) ²	AF9
Field Tab	CTRL-I	
Field Backtab	ESC CTRL-I	ESC
Column Tab	ESC →	ESC →
Column Backtab	ESC ←	ESC ←
Indent	ESC ↑	ESC ↑
Undent	ESC ↓	ESC ↓
PA1	F4 or ESC , (comma) ³ or ESC <	AF2 or ESC , (comma) ³ or ESC <
PA2	- (hyphen) or ESC > or ESC . (period) ³	AF4 or ESC > or ESC . (period) ³
PA3	, (comma) ² or ESC / (slash) or ESC ? (question mark)	AF6
Newline	LF	CTRL-
Home	BACK SPACE	←
Cursor Up	↑	↑
Cursor Down	↓	↓
Cursor Right	→	→
Cursor Left	←	←

¹ Under PCPlot, AFn means to depress the ALT key with the Fn key.

² This key can be found only on the additional numeric keypad on the right side of the VT-100, Hazeltine or IBM PC.

³ This key can be found only on the main keypad. Do not select a similar key on the additional numeric keypad on the right side of the VT-100, Hazeltine or IBM PC keyboard.

Program Function Keys

<u>IBM FUNCTIONS</u>	<u>Hazeltine</u>	<u>PCPlot¹</u>
PF1	ESC 1 ³ or F1	ESC 1 ³ or F1
PF2	ESC 2 ³ or F2	ESC 2 ³ or F2
PF3	ESC 3 ³ or F3	ESC 3 ³ or AF1
PF4	ESC 4 ³ or 7 ¹	ESC 4 ³ or F3
PF5	ESC 5 ³ or 8 ¹	ESC 5 ³ or F4
PF6	ESC 6 ³ or 9 ¹	ESC 6 ³ or AF3
PF7	ESC 7 ³ or 4 ¹	ESC 7 ³ or F3
PF8	ESC 8 ³ or 5 ¹	ESC 8 ³ or F6
PF9	ESC 9 ³ or 6 ¹	ESC 9 ³ or AF5
PF10	ESC 0 ³ or 1 ¹	ESC 0 ³ or F7
PF11	ESC - (hyphen) ³ or 2 ²	ESC - (hyphen) ³ or F8
PF12	ESC = or 3 ²	ESC = or AF7
PF13	0 ² F1 or ESC q ⁴	F9 F1 or ESC q ⁴
PF14	0 ² F2 or ESC w ⁴	F9 F2 or ESC w ⁴
PF15	0 ² F3 or ESC e ⁴	F9 AF1 or ESC e ⁴
PF16	0 ² 7 ² or ESC r ⁴	F9 F3 or ESC r ⁴
PF17	0 ² 8 ² or ESC t ⁴	F9 F4 or ESC t ⁴
PF18	0 ² 9 ² or ESC y ⁴	F9 AF3 or ESC y ⁴
PF19	0 ² 4 ² or ESC u ⁴	F9 F3 or ESC u ⁴
PF20	0 ² 5 ² or ESC i ⁴	F9 F6 or ESC i ⁴
PF21	0 ² 6 ² or ESC o ⁴	F9 AF5 or ESC o ⁴
PF22	0 ² 1 ² or ESC p ⁴	F9 F7 or ESC p ⁴
PF23	0 ² 2 ² or ESC _ (underscore)	F9 F8 or ESC _ (underscore)
PF24	0 ² 3 ² or ESC +	F9 AF7 or ESC +

Local Reset and Control Functions

<u>IBM FUNCTION</u>	<u>Hazeltine</u>	<u>PCPlot¹</u>
Master Reset (Reinitialize Terminal)	CTRL-G	CTRL-G
Character Error Reset (Clear Parity Error)	CTRL-R	CTRL-R
Keyboard Unlock (IBM Reset Function)	CTRL-T	CTRL-T
Type-ahead Purge	CTRL-X	CTRL-X
Pacing Start	CTRL-S	CTRL-S
Pacing Stop	CTRL-Q	CTRL-Q

¹ Under PCPlot, AF_n means to depress the Alt key with the Fn key.

² This key can be found only on the additional numeric keypad on the right side of the VT-100, Hazeltine or IBM PC.

³ This key can be found only on the main keypad. Do not select a similar key on the additional numeric keypad on the right side of the VT-100, Hazeltine, or IBM PC keyboard.

⁴ This character may be typed in as uppercase or lowercase.

Setup Functions

<u>IBM FUNCTION</u>	<u>Hazeltine</u>	<u>PCPlot¹</u>
Set Column Tab	ESC ` CTRL-I	ESC ` CTRL-I
Delete Column Tab	ESC ` DEL	ESC ` DEL
Set Left Margin	ESC ` LF	ESC ` CTRL-
Set Home Line	ESC ` BACKSPACE	ESC ` ←
Delete All Column Tabs, Home Line and Left Margin	ESC ` ENTER ²	ESC ` AF8 or ESC ` AF10
Improved Null Processing	ESC ` N	ESC ` N
3270 Null Processing	ESC ` n	ESC ` n
Zones Mode On	ESC ` z	ESC ` z
Zones Mode Off	ESC ` Z	ESC ` Z
Reverse Enter/Newline Keys	ESC ` e	ESC ` e
Restore Enter/Newline Keys	ESC ` E	ESC ` E
Reverse Column and Field Tab Keys	ESC ` c	ESC ` c
Restore Column and Field Tab Keys	ESC ` C	ESC ` C
Alpha in Numeric-Only Field	ESC ` v	ESC ` v
3270 Numeric Fields	ESC ` V	ESC ` V
3278 Insert Mode	ESC ` i	ESC ` i
3277 Insert Mode	ESC ` I	ESC ` I
Suppress Pacing	ESC P	ESC ` P
Restore Pacing	ESC p	ESC ` p
Keyboard Initiated Line Drop	ESC ` ,(period) ³	ESC ` ,(period) ³
Return to ENTER TERMINAL TYPE Message	ESC ` ,(comma) ³	ESC, ` ,(comma) ³
Dvorak Keyboard Arrangement	ESC ` q	ESC ` q
Primary Keyboard Arrangement	ESC ` Q	ESC ` Q

¹ Under PCPlot, AFn means to depress the Alt key with the Fn key.

² This key can be found only on the additional numeric keypad on the right side of the VT-100, Hazeltine or IBM PC.

³ This key can be found only on the main keypad. Do not select a similar key on the additional numeric keypad on the right side of the VT-100, Hazeltine or IBM PC keyboard.

Keyboard Definitions for the VT220 Terminal and SmarTerm Emulator

Control and Cursor Movement Keys

<u>IBM</u>	<u>VT220</u>	<u>SmarTerm</u>
Enter	RETURN or ENTER	
Clear	NEXT SCREEN	F10
Redisplay	CTRL-V	CTRL-V
Erase EOF	F19	ALT-4
Delete Character	REMOVE	F7
Toggle Insert Mode	INSERT HERE	F6
Field Tab	TAB	
Field Backtab	FIND TAB	F5
Column Tab	FIND →	F5 →
Column Backtab	FIND ←	F5 ←
Indent	F18	ALT-3
Undent	F17	ALT-2
PA1	FIND , (comma) or FIND <	F5 , (comma) or F5 <
PA2	FIND . (period) or FIND >	F5 . (period) or F5 >
Newline	F13	ALT-F8
Home	F14	ALT-F9
Cursor Up	↑	↑
Cursor Down	↓	↓
Cursor Right	→	→
Cursor Left	←	←

Program Function Keys

<u>IBM</u>	<u>VT220</u>	<u>SmarTerm</u>
PF1	PF1	F1 or ESC 1
PF2	PF2	F2 or ESC 2
PF3	PF3	F3 or ESC 3
PF4	PF4	F4 or ESC 4
PF5	CTRL-5 ¹	ESC 5
PF6	F6	ALT-F1 or ESC 6
PF7	F7	ALT-F2 or ESC 7
PF8	F8	ALT-F3 or ESC 8
PF9	F9	ALT-F4 or ESC 9
PF10	F10	ALT-F5 or ESC 0
PF11	F11	ALT-F6 or ESC - (hyphen)
PF12	F12	ALT-F7 or ESC =
PF13	FIND PF1	F5 F1 or ESC q
PF14	FIND PF2	F5 F2 or ESC w
PF15	FIND PF3	F5 F3 or ESC e

¹ This key can only be found on the main keypad. Do not select a similar key on the additional numeric key pad.

PF16	FIND PF4	F5 F4 or ESC r
PF17	FIND CTRL-5 ¹	ESC t
PF18	FIND F6	F5 ALT-F1 or ESC y
PF19	FIND F7	F5 ALT-F2 or ESC u
PF20	FIND F8	F5 ALT-F3 or ESC i
PF21	FIND F9	F5 ALT-F4 or ESC o
PF22	FIND F10	F5 ALT-F5 or ESC p
PF23	FIND F11	F5 ALT-F6 or ESC [
PF24	FIND F12	F5 ALT-F7 or ESC]

Local Reset and Control Functions

<u>IBM</u>	<u>VT220</u>	<u>SmarTerm</u>
Master Reset (Reinitialize Terminal)	CTRL-g	CTRL-g
Character Error Reset (Clear Parity Error)	CTRL-r	CTRL-r
Keyboard Unlock (IBM Reset Function)	CTRL-t	CTRL-t
Type-ahead Purge	CTRL-x	CTRL-x
Pacing Start	CTRL-s	CTRL-s
Pacing Stop	CTRL-q	CTRL-q

Setup Functions

<u>IBM</u>	<u>VT220</u>	<u>SmarTerm</u>
Set Column Tab	SELECT TAB	F8
Delete Column Tab	SELECT DEL	F8 DEL
Set Left Margin	SELECT F13	F8 ALT-F8
Set Home Line	SELECT F14	F8 ALT-F9
Delete All Column Tabs, Home Line and Left Margin	SELECT NEXT SCREEN	F8 F10
Improved Null Processing	SELECT N	F8 N
3270 Null Processing	SELECT n	F8 n
Enter APL	SELECT a	F8 a
ASCII in APL	SELECT m	F8 m
Exit APL	SELECT A	F8 A
Zones Mode On	SELECT z	F8 z
Zones Mode Off	SELECT Z	F8 Z
Reverse Enter/Newline Keys	SELECT e	F8 e
Restore Enter/Newline Keys	SELECT E	F8 E
Reverse Column and Field Tab Keys	SELECT c	F8 c
Restore Column and Field Tab Keys	SELECT C	F8 C
Alpha in Numeric-Only Field	SELECT v	F8 v
3270 Numeric Fields	SELECT V	F8 V
3278 Insert Mode	SELECT i	F8 i
3277 Insert Mode	SELECT I	F8 I
Alternate display attributes (color)	SELECT d	F8 d
Normal display attributes	SELECT D	F8 D

Line Drop (hang up modem)	SELECT . (period) ¹	F8 . (period)
Return to ENTER TERMINAL TYPE Message	SELECT , (comma) ¹	F8 , (comma)
Dvorak Keyboard Arrangement	SELECT q	F8 q
Primary Keyboard Arrangement	SELECT Q	F8 Q

¹ This key can only be found on the main keypad. Do not select a similar key on the additional numeric keypad.

USING AN ANSI-CONFORMING TERMINAL WITH THE IBM 3090 †

Set your terminal to use 7 bit EVEN parity.

Use the GANDALF class code IBM, or the class code 71.

In response to ENTER TERMINAL TYPE: vt100

The following is a subset of the IBM function keys and the equivalent VT100 key sequence. The ASCII code sequence is sometimes useful for duplicating the VT100 key sequence.

IBM FUNCTION	VT100 Key Sequence	ASCII Code Sequence
Enter	RETURN	CR
Clear	ENTER	ESC O M
Cursor movement	Arrow keys	
Up		ESC O A
Down		ESC O B
Right		ESC O C
Left		ESC O D
Delete character	DELETE	DEL
Insert Mode Toggle	keypad period (.)	ESC O n
Erase EOL	ESC DELETE	ESC DEL
Newline	LINE FEED	LF
Home	BACKSPACE	BS

Programmable function keys:

PFK1	PF1	ESC 1
PFK2	PF2	ESC 2
PFK3	PF3	ESC 3
PFK4	Keypad 7	ESC 4
PFK5	Keypad 8	ESC 5
PFK6	Keypad 9	ESC 6
PFK7	Keypad 4	ESC 7
PFK8	Keypad 5	ESC 8
PFK9	Keypad 6	ESC 9
PFK10	Keypad 1	ESC 0
PFK11	Keypad 2	ESC -
PFK12	Keypad 3	ESC =

PA1	PF4	ESC ,
-----	-----	-------

Acts as a toggle between CP and CMS.

PA2	Keypad hyphen (-)	ESC .
-----	-------------------	-------

In CMS this clears the screen except for the command line.

Local Reset and Control Functions:

Master Reset	CTRL and g
Keyboard Unlock	CTRL and t
Type-ahead Purge	CTRL and x
Pacing Start	CTRL and s
Pacing Stop	CTRL and q

† From H. Berry's (AMD) Lectures.

VIRTUAL MINIDISKS

PERMANENT MINIDISKS

Disks that persist across logons.
These disks are defined in your CP
directory.

TEMPORARY MINIDISKS

Disks that are automatically destroyed
at LOGOFF.

The operating system CP identifies a minidisk LINKed to your Virtual Machine by a 3-digit hexadecimal number called the minidisk VIRTUAL ADDRESS. For example, every user should have a permanent Read/Write minidisk at Virtual Address 191. To view all the minidisks LINKed to your Virtual Machine use the command:

Query DASD

The operating system CMS identifies a minidisk ACCESSED to your Virtual Machine by a FILEMODE letter (A to Z). The filemode defines the CMS search order for locating a file on one of the user's minidisks. Normally, the user's 191-disk is accessed at filemode A (but the filemode of a disk can easily be changed). To view all the minidisks ACCESSED by your Virtual Machine use the command:

Query DISK

EXAMPLE: A typical minidisk configuration.

label	CUU	M	status	cyl
BER191	191	A	R/W	3
CMS190	190	S	R/O	28
CMS59E	59E	T	R/O	150
CMS59F	59F	U	R/O	100
CMS19E	19E	Y/S	R/O	100

The minidisk label is assigned to one's own permanent minidisks using the FORMAT command. The column marked CUU refers to the Virtual Address for each minidisk. The column marked M identifies the filemode for each disk. All the disks with status R/O are system disks accessed in Read Only mode. The size of each minidisk is measured in cylinders (.6 M.bytes/cylinder).

The GIME command is useful for getting read access to someone's permanent minidisks, and for creating temporary scratch disks:

EXAMPLE: To get read access to Berry's 191-disk, issue the command:
GIME BERRY

EXAMPLE: To create a 10 cylinder temporary minidisk:
GIME 10

CMS FILES

FILEID: A file is identified by the three parts:

FILENAME	FILETYPE	FILEMODE	
Examples:	MYFILE	FORTRAN	A1 A FORTRAN source file
	MYFILE	TEXT	A Object code file produced by compiler
	MYFILE	LISTING	A Listing file produced by compiler
	MYFILE	MODULE	A Executable image file
	MYLIB	TXTLIB	B TEXT library
	FILE	FT02F001	A Default FORTRAN fileid for unit 2
	ELASTIC	DATA	* Wildcard applies only to input files
	PROFILE	EXEC	User file is executed automatically at LOGON (or whenever IPL CMS is issued).
	PROFILE	XEDIT	User created file is executed automatically whenever the user edits a file.

IBM does NOT support:

- (1) Logical names
(DDNAME acts somewhat like a logical name)
- (2) Hierarchical directories
(each minidisk has its own directory)
- (3) File version numbers, or cycle numbers

Example: To compile, load and execute the file: TEST FORTRAN C
where the minidisk with filemode C is a Read/Write disk.

```
FOR TEST          Creates object file TEST TEXT C
LOAD TEST (START  Load and execute

or

FOR TEST
LOAD TEST
START
```

The GLOBAL command is used to declare CMS libraries and their search order.
At BNL the user's default PROFILE EXEC issues the following GLOBAL commands:

```
GLOBAL TXTLIB VSF2FORT CMSLIB TSOLIB
GLOBAL LOADLIB VSF2LOAD
```

VSF2FORT contains the standard IBM service and mathematical subroutines.
VSF2LOAD is needed to dynamically load certain I/O routines at execution time.
The remaining libraries are needed for some system operations. It may occur
that the default GLOBAL libraries are destroyed by a severe error condition
in which case one needs to reenter the above GLOBAL statements.

Additional user TXTLIB libraries can be appended by use of the command:

```
ADDLIB txtlib1 txtlib2 . . .
or use
GLOBAL TXTLIB VSF2FORT CMSLIB TSOLIB txtlib1 txtlib2 . . .
```

EXAMPLE: TO COMPILE, LOAD AND EXECUTE A FORTRAN PROGRAM

Program MMC2PW uses the following files:

```

UNIT  RELAVANT FORTRAN STATEMENTS
  2    WRITE(2,xxxx)
  5    READ *
        READ xxxx,
  6    PRINT *
        PRINT xxxx,
  3    OPEN(UNIT=3, FILE='ELASTIC', STATUS='OLD', ERR=1000)
        READ(3,xxxx)
        READ(3,*)

```

VAX MEIHDOD:

```

PUBLIC  IMSL
FOR     MMC2PW
LINK   MMC2PW, IMSLIBS/LIB
DEFINE ELASTIC ELASTIC.DAT
DEFINE/USER SYS$INPUT MMC2PW.INP
RUN    MMC2PW

```

IBM METHOD:

```

GIME   PUBLIC
ADDLIB IMSLS
FOR    MMC2PW
FILEDEF 2 DISK MMC2PW OUT A (PERM IRECL 133
FILEDEF 5 DISK MMC2PW INP *
FILEDEF ELASTIC DISK ELASTIC DAT *
LOAD   MMC2PW (START

```

NOTES:

- (1) The PUBLIC minidisk contains the mathematics libraries.
- (2) ADDLIB appends the single precision IMSL TXLIB library to the GLOBAL library list.
- (3) The file MMC2PW FORTRAN contains the file to be compiled. It may exist on any one of the accessed minidisks.
- (4) Unit 2 (output) is associated by the FILEDEF command with the file MMC2PW OUT on the A-disk. PERM prevents the file definition from being cleared by a future compilation, but NOT by an ABORT condition. IRECL 133 makes the record length 133 characters (the default is 80).
- (5) Unit 5 (input) is associated with the disk file MMC2PW INP. The asterisk is a wild card for the filemode. All accessed disks are searched for the file in the order A to Z.
- (6) Unit 6 (output) defaults to the terminal screen.
- (7) Unit 3 (input) is associated by the FORTRAN OPEN statement with the name ELASTIC. The FILEDEF command associates the name ELASTIC with the file ELASTIC DAT located on one of the accessed disks.
- (8) LOAD creates an executable program in memory from the object file MMC2PW TEXT created by the FORTRAN compilation. The GLOBAL libraries are searched for unsatisfied externals. The option START executes the program.

EXAMPLE BATCH JOB ON THE IBM

The file MMC2PW EXEC A contains the following REXX statements:

```
/* EXEC TO RUN THE MMC2PW PROGRAM */
'GIME PUBLIC'
'ADDLIB IMSLS'
'FILEDEF 2 DISK MMC2PW OUT A (LRECL 133'
'FILEDEF 5 DISK MMC2PW INP *'
'FILEDEF ELASTIC DISK ELASTIC DAT *'
'LOAD MMC2PW (START NOMAP'
EXIT
```

The EXEC is executed interactively by typing the command:
MMC2PW

To execute the EXEC as a batch job, issue the command:
BATCH SUBMIT (options) MMC2PW

NOTES:

1. A REXX exec must begin with a comment statement: /* comment */
Any statement within quotes is passed to CMS without interpretation by the command language interpreter.
The EXIT statement is an optional REXX command to terminate the file.
4. Some important differences between interactive and batch execution:
 - (a) A batch job is executed by another virtual machine called the Batch Worker. The disk configuration for the submitter's machine is not the same as for the Batch Worker's machine. In particular, the submitter's 191-disk is automatically accessed as the Batch Worker's B-disk in Read Only mode. Thus, the reference to the two files:


```
MMC2PW INP *
ELASTIC DAT *
```

 will succeed if the files appear on the submitter's 191-disk. The asterisk is a wild card used to specify the filemode. CMS will search for the files on all of the batch worker's disks to locate them, presumably at filemode B.
 - (b) The batch worker's A-disk is available for output files created by the batch job. Any files that remain on this disk when the job completes will be returned to the submitter's Reader. The example case creates the output file:


```
MMC2PW OUT A
```

 on the batch worker's A-disk, and hence will be returned to the user's Reader when the job completes.
 - (c) The batch job writes the information that is normally produced interactively to a Console file using the submitter's userid as the filename. This file also contains details pertaining to the batch worker's performance. This file will also be returned to the submitter's Reader.
 - (d) The Batch Worker executes the submitter's PROFILE EXEC file before executing the file MMC2PW EXEC, but the option NOPROF can be used to suppress the PROFILE.
 - (e) Limits are placed on the batch worker's use of machine resources. These limits (such as CPU time and Printer and Punch file sizes) can be specified as options.

MISCELLANEOUS COMMANDS

Logon userid	To identify a user to the system, and to permit access to the system.
LOGout [HOLD]	To terminate a session. HOLD retains the connection on a switched line so that it is not necessary to reconnect in order to logon again.
Xedit fn ft fm	The CMS editor.
DEFine DEF STOR 4M	Makes changes to your virtual machine configuration (i.e., to increase your virtual memory or add virtual devices.) When you change virtual memory it is then necessary to IPL CMS before you can continue.
IPL CMS	Simulates an Initial Program Load of CMS.
DISConn [HOLD]	Disconnects your terminal from the system while the virtual machine continues operation. Temporary files are retained (but not if the system should crash).
CP command	Transmits commands directly to the Control Program (CP).
CMS command	Transmits commands directly to the Conversational Monitor System (CMS).
HI	Immediate command to halt an EXEC.
HX	Immediate command to halt execution and return to CMS.
HT	Immediate command halts terminal output, but continues execution.
FTP node	Allows you to transfer files to/from other machines connected to Ethernet using the TCP/IP protocol.
TELNET node	Allows you to logon to other machines connected to Ethernet using the TCP/IP protocol.
SETPFN	Sets the PF function keys for the CMS environment. PF7 and PF8 retrieves previous commands forward/backward.

HELP and QUERY

AID keyword	An index that suggests how to find information related to a given keyword.
Help	Provides information on VM commands, Execs, Error messages, Libraries, etc.
HELPRINT	Prints the Help response to a central printer, or stores the information on disk.

Query DISK Displays the status of your accessed disks. That is, all disks which are known to CMS.

Query DASD Displays the status of your linked disks. That is, all disks which are known to CP.

Other Query commands of interest are: Query files, Query Reader, and Query Virtual.

USERS Displays information about logged-on users.

WHOS user Gives information about a VM userid.

CONSPIRE Bulletin board and conferencing system. Useful for asking questions or getting information from other users.

DISKLIST \$gg Lists all minidisks that belong to a user or a group.

FORTIRAN COMMANDS

FORTvs2 name Compiles the first file found with fileid: name FORTIRAN *

LOAD name Loads into memory the object file: name TEXT *

INCLUDE name Includes the object file: name TEXT * as part of a load sequence.

START Starts execution of a loaded program.

Genmod name Creates a nonrelocatable (MODULE) file from a loaded program.

Global TXTLIB lib1 lib2 . . . libn Declares libraries to be searched for unsatisfied externals. A member of a library consists of one or more routines.

TXTLib GEN libname fn1 fn2 . . . Creates a TXTLIB library using the given TEXT files.

ADD libname fn1 fn2 . . . Adds TEXT files to a library.

DEL libname m1 m2 . . . Deletes members from a library.

MAP libname Produces a map listing of a library.

TXTADD libname fn1 fn2 . . . Adds TEXT files to a TXTLIB library but makes each ROUTINE a separate member. TXTLIB makes each FILE a separate member.

Filedef ddname DISK fn ft fm Establishes the connection between program I/O and a disk file. ddname may be the unit number if there is no OPEN statement, or it is the name specified by FILE = 'ddname' in the OPEN statement.

- FILEdef When no arguments are given this command displays a list of current filedef definitions.
- Query TXTLIB Displays a list of the current TXTLIB libraries to be searched for unsatisfied externals during a Load sequence.

MINIDISK COMMANDS

- FILEList fn ft fm Uses the Xedit environment to display information about CMS files residing on accessed disks. You can issue CMS commands for the files directly from the displayed list.
- GIME 10 To create a scratch minidisk of 10 cylinders.
GIME 10 E The scratch minidisk is assigned filemode E.
- GIME BERRY Accesses BERRY'S 191-disk in read only mode.
GIME BERRY 195 Accesses BERRY'S 195-disk in read only mode.
GIME BERRY 195 F Accesses BERRY'S 195-disk in read only mode at filemode F.
- LINK Links a minidisk to your virtual machine. This makes the minidisk known to CP.
- ACCESS Accesses a linked minidisk. This makes the minidisk known to CMS. GIME is equivalent to the LINK, ACCESS sequence.
- DROP E Removes the minidisk with filemode E from your virtual machine, so the disk is neither linked nor accessed.
- DETach 205 When the disk at address 205 is linked to your machine but not accessed, this is the way to get rid of it.
- COPYfile Copies and/or modifies disk files.
- DIFFER Compares two files and reports differences to the user. More flexible and powerful than IBM's COMPARE command.
- ERASE Deletes one or more files from a read/write disk. DISCARD will do the same thing.
- Print Prints a file on one of the central printers.
- PUnch Punches a disk file to your virtual punch.
- RECOVER To restore part or all of a minidisk from a backup tape. If you accidentally destroy a file this is the way to recover yesterday's version.
- Rename Changes the fileid of one or more files on a read/write disk.
- Type Displays all or any part of a file at the terminal.

- ARCHIVE Use this command to store files in archival storage for long term retention. ARCHIVE LIST will produce a listing of all your archived files.
- SPACE Creates permanent minidisks and temporary disks that survive logout, and makes other directory updates not normally available to the general user. Only a Space Administrator for a group can make permanent minidisks for members of the group.
- FORMAT After a permanent minidisk is created it is necessary to format the disk before it can be ACCESSED to your virtual machine. Default blocksize is 4K. To follow convention user BLACK would use the label BLA193 for his 193-disk. Example: FORMAT 193 C (BLA193)
- DIRMaint Gives information about your own VM directory entry, or makes directory updates. You can use this command to set WRITE passwords for one of your minidisks. You should leave your READ password as ALL. Disks that are READ protected are not backed up by the nightly backup.
- INSTALL Allows a group of people to share the use of specially designated minidisks. The operating system does not allow two people to have write access to a minidisk at the same time; using INSTALL to maintain files on the disk is a way of avoiding this conflict.

BATCH COMMANDS

- BATCH A utility for submitting jobs to be executed independently of your own virtual machine. Only batch jobs are permitted access to the tape drives.
- SETUP Acquires real tape drives and mounts the first tape on each drive. This command must be part of a batch job.
- MOUNT To perform subsequent TAPE volume mounting and verification.
- TAPE Dumps CMS formatted files from disk to tape, loads previously dumped
- TAPEIT An Exec for writing source programs, and other coded files to tape in a format suitable for transport to non-IBM computers.
- DISKIT
BLOCKIT These two Execs combined do the reverse of TAPEIT. Can be used to read coded tape files created by non-IBM computers.
- CARD DUMP Dumps a file to the Virtual Punch which then gets sent back to the submitter's Reader.

SPOOL COMMANDS

RDRList	To list the files in your virtual Reader. Uses the Xedit environment. Subcommands exist to RECEIVE files to disk or PEEK at their contents.
TRAnSfer	To transfer your closed spool files to a specified user or queue, or to reclaim closed spool files that you created.
CHange	To modify attributes of closed spool files.
PURge	To remove a closed spool file from the system before it is printed on a real device or before it has been read by a user.
SPool	To modify the spooling options in effect for a virtual device. May be used to redirect a file to a remote location.
QSPool	Allows any user to see which spool files exist for another user or for the entire system.
PRISTAT	Show the status of print queues.

COMMUNICATIONS COMMANDS

NEWS	Displays news items. Maintains a pointer to last item read.
NOTE	To send a short communication to one or more people on this computer or to a remote site using the Remote Spooling Communications Subsystem (RSCS) network. Uses the Xedit editor to compose the note.
NAMES	To display a menu from which you can create, change, and remove entries in a "userid NAMES" file. The NAMES file is referenced by both the NOTE, SENDFILE and TELL commands.
SENDFILE	To send files to one or more people on this computer or on remote sites using the RSCS network. SENDFILE and NOTE both reference a "userid NAMES" file. By creating a NAMES file, you can identify recipients by using their nickname which is automatically converted into a node and userid.
TELL	Sends a message to a logged-on VM user. Can be used with the NAMES file to address a person by nickname.

WHERE TO GET HELP

New IBM Accounts, General Information (HELP DESK) . . . x4159

FORTRAN Conversion Questions (A. Harris) 4115

(H. Berry) 4152

File Migration Questions from CDC to IBM (R. Evans) . . 2851
and Questions on using HISTORIAN

Using Tapes on the IBM (F. Krieger) 4153

Graphics Questions (G. Smith) 3216

For on-line HELP don't forget to use AID, HELP, and
the CONSPIRE conferences SOS, CONVERT and FORTRAN

DOCUMENTATION

IBM CMS Primer SC24-5236

ENL VM-CMS Tutorial ENL DOC.

VS FORTRAN Language and Library Reference SC26-4221

VS FORTRAN Programming Guide SC26-4222

VS FORTRAN Interactive Debug Guide and Reference . . . SC26-4223

Engineering and Scientific Subroutine Library SC23-0184
Guide and Reference

System Product Interpretation User's Guide (REXX) . . . SC24-5238

System Product Interpreter Reference (REXX) SC24-5239

VM MEMO 12: VM TAPE USER'S GUIDE SLAC DOC.

VM MEMO 13: USING THE SLAC BATCH SYSTEM SLAC DOC.

VM MEMO 20: THE CARE AND FEEDING OF YOUR SLAC DOC.
VIRTUAL MACHINE

VM MEMO 24: ENVIRONMENT DEBUGGING STRATEGIES SLAC DOC.

VM MEMO 3: THE INSTALL FACILITY SLAC DOC.