

Computing at IPNS

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1. Introduction

IPNS has a number of computers for use by the staff and visitors. Most time-shared computing is done on a VMS cluster consisting of a DEC 3000-400 AXP computer, an Alphaserver 1000 4/200 computer, a MicroVAX 3500 computer, and a VAXstation 4000-60. There are also VMS computers for neutron scattering instruments which are used for experiment control and data analysis. For information on the Instrument computer systems see the Instrument User Manual available from Kent Crawford. There is also a more extensive Instrument-Manager/Programmer Manual which Kent has written.

Besides the VMS computers, we have a few UNIX systems and most staff members have a Macintosh or a Windows personal computer which is used for word-processing, etc. We have two servers running Windows NT to allow sharing of files between PC's and Macs and to provide other services. There is a Power Mac QuickMail server in Bldg. 360 F201 which handles mail for the Macintosh and PC computers.

All VMS computer systems at IPNS are networked together using Ethernet hardware and DECnet software. They also have Multinet, which gives the ability to use **TCP/IP** (Transmission Control Protocol/Internet Protocol) tools. "Telnet" is used to log into other computers on the Internet, "FTP" is used to copy files to or from remote computer systems, and "SMTP" (Simple Mail Transfer Protocol) or "MX (Mail eXchange) is used to send Internet mail. All our PC's and most Mac computers and our shared printers are also attached to the Ethernet.

Most of our laser printers are attached to the Ethernet and can be accessed by either the VMS computers using Pathworks for Macintosh or directly from the Macintosh and Windows computers. UNIX machines can connect directly to some printers. For other printers, UNIX machines must print through the VMS computers using MultiNet LPD. To use any of the shared systems you must have a username and a password. Contact Tom Worlton (360-L120; 2-8755 to get your own account on the VMS data analysis systems. John Hammonds or George Ostrowski can assist in setting up accounts on the Data collection computers.

In the examples given in this manual, the dollar sign (\$) at the beginning of a line refers to the VMS command prompt. Your actual prompt can be changed by the "Set Prompt" command.

1.1 Accounts at ECT

Some IPNS division members may require accounts on an Electronics Computing and Telecommunications Division (ECT) computer. Before applying for such an account from ECT User Services, see Ira Bresof (360-L120; 2-8705) or Tom Worlton (2-8755) for the IPNS computing cost code number.

1.2 Other Manuals

Manuals for operation of the IPNS Instrument computers are available from each Instrument Scientist. Kent Crawford has written a User Manual for the data acquisition software and a more detailed "Instrument-Manager/Programmer Manual". For copies of these manuals, contact Kent or the Instrument Scientist. Some additional manuals are available from Tom Worlton, and some Argonne and vendor manuals are available from the ECT Document Distribution Center (DDC) in Building 221 (phone 2-5405). You must furnish a cost code number to ECT to obtain materials from the DDC.

2. Introduction to VMS

This chapter explains how to use a VAX/VMS or Alpha/OpenVMS computer system. OpenVMS has on-line help for most commands. To see the available help topics, type HELP at the OpenVMS prompt (all commands must be followed by a RETURN or ENTER). All OpenVMS commands can be abbreviated to four characters or less.

If you are using a workstation or terminal that has X Windows capability, you can display the entire OpenVMS documentation set on your screen through the Bookreader application. This is generally the first entry in the Applications menu of the Session Manager.

The DEC documentation set consists of three CDROMS which are mounted in the IPNS Infoserver. In order to access these volumes, they must be "bound" using the Local Area Disk protocol (LADCP). Binding the volumes using LADCP will produce devices DAD0, DAD1, DAD2, and DAD3. The procedure `ESS$MOUNT` in `SYS$STARTUP` is used by the system manager to mount the Infoserver disks.

Once these virtual devices have been created, they can be mounted on the system. If the Bookreader is not working, enter the command:

```
$ SHOW DEVICE DAD
```

If the four DAD devices do not exist, or if the latter three are not mounted, Bookreader will not work. Contact the System Manager to report the problem.

2.1 Logging on to a VMS System

2.1.1 From a Local Terminal Server

All of the IPNS terminals, except for X Window terminals, are connected to the IPNS Ethernet through a terminal server. This device allows a user to log on to any of the VMS nodes using the command:

```
Local> CONNECT node_name
```

If the port on the terminal server has been logged out, it will display the “Username” prompt. This is different from the VMS “Username” and can actually be any name, but in order to make it easier to keep track of the ports it is preferable to give the terminal location/ID as a username to the terminal server. Once you enter a username, the terminal server will display the “Local>” prompt and you can enter the “connect” command.

The DEC terminal servers only allow connecting to DEC computers with the “connect” command, but we also have two Emulex terminal servers which can “Telnet” directly to any Internet node. You can tell you are connected to one of these Emulex servers because they use "Server>" as the local prompt. These servers allow you to connect to UNIX machines as well as VMS machines.

If a session is already active, you can get to local mode by hitting the BREAK key. You can then start another session, up to a maximum of four sessions. To switch between sessions, type CTRL_F, or if CTRL_F has not been defined as the Forward Switch, go to local mode and RESUME the desired session.

2.1.2 Login and Logout Command Files

During the login procedure VMS will execute a file called LOGIN.COM if it exists in the user's root directory. This file is used to set up default names and processes. VMS provides lexical functions which can be used to determine the mode of execution (BATCH, INTERACTIVE, NETWORK), Node name, date, time, day-of-week, etc. These are often useful in login command files. If there is a file called LOGOUT.COM in your login default directory, this will be executed when you log out of the computer using the LOG command. If you type BYE instead of LOG, the LOGOUT.COM file in SYS\$MANAGER will be executed. This will purge the files in your current directory to the two latest versions.

2.2 Controlling a VMS Session

To allow complete flexibility in controlling a VMS session, you should be familiar with the ^T, ^Y, ^C, ^Z, and ^W terminal keys. The caret (^) in front of a character means that you hold down the Control key while typing the following character. The features invoked by these keystrokes apply universally to DEC full screen terminals, non-DEC Video terminals, and terminal emulation programs running on a personal computer.

2.2.1 ^T or Is it Still Running

Occasionally, you will execute some program or system command that produces no feedback and appears to have stalled. Enter ^T and the system will respond with information about the command it is executing and the accumulated processor time in seconds. Enter another ^T and compare the processing times to see if execution is continuing.

2.2.2 ^C, ^Z or Stop

Sometimes you will want to stop or interrupt a program (or command) that you have initiated. The ^Y command interrupts your executing program. When the system recognizes the ^Y, it interrupts the program and returns your session to the DCL prompt level. At this point, you may issue (a) the CONTINUE command, (b) a command that will permit you to resume the interrupted program later, or (c) a command that will not permit you to resume the interrupted program later.

If you enter the CONTINUE command, the interrupted program will begin at precisely the same point where the interruption occurred. The ^Y is a request to interrupt and also to store the entire context (state) of the running program.

You can enter a command at the DCL prompt that does not destroy the stored context (state) of the interrupted program and then continue the interrupted program after the command finishes. Certain VMS commands (such as SPAWN and some of the SET commands) do not replace the previous context. Because these commands execute in the VMS memory space, the commands do not run separate programs and do not create a new process context. Enter the CONTINUE command to resume the interrupted program. When you enter a command at the DCL prompt that executes a new program, the context of the interrupted program will be lost, and you will no longer be able to restart it. To terminate a suspended program without starting another, enter the EXIT command, and the system will delete the context of the interrupted program.

No specific command is necessary to stop a program. The ^Y interrupt is very powerful because it permits restarts.

The ^C is another interrupt directive. When you enter ^C while a program is executing, the ^C will either behave like a ^Y, or it will exhibit some program-specific behavior. For example, the command:

```
$ TYPE LOGIN.COM;*
```

types all versions of your login procedure. If there were many versions, and after a certain point you did not wish to view the rest of the version being currently displayed, you could enter ^C. The TYPE command would then begin processing the next most recent version. See language-specific documentation such as "Guide to Programming on VAX/VMS (AI-Y503B-TE)" to learn how to use the ^C interrupt in programs that you run. If no specific action is programmed, then default ^C behaves like the ^Y interrupt.

Another kind of stop directive is ^Z, which signifies end of input to programs that are reading from the terminal input device (keyboard), either with or without a program-specific input prompt. Two typical examples are the DCL CREATE command and the MAIL utility. The CREATE command permits you to create a file that contains the records that you enter at the terminal after you enter CREATE. There is no prompting; each input record becomes a part of the file until you signal end of input with the ^Z directive. A session would appear as follows:

```
$ CREATE FILE.TMP
```

```
This is record one.
```

```
...
```

```
last record
```

```
^Z
```

```
$ ...
```

In most utility programs that prompt you for input from the terminal, you can enter either ^Z or EXIT to terminate. For example, after you send a message with the MAIL utility in interactive mode, the program prompt again appears. Answer with ^Z or EXIT to terminate as follows:

```
MAIL>^Z
```

```
$ ...
```

2.2.3 ^W or Refresh the Terminal Screen

While working in full screen mode, your display may occasionally receive broadcast messages (such as notification of mail reception) that may obliterate portions of information from your screen. Entering ^W will cause the system to resend all of the screen information and refresh the screen.

2.3 VMS Command Line Recall and Editing

You have just typed in a long VMS command that looks correct. When you enter the command, you find that some typographical error prevents execution. Should you type the command over again? NO! Use the VMS command line recall feature to bring back the last command, edit it to fix the error, and reissue the command. This section explains how to use this time-saving feature of VMS.

2.3.1 Command Line Recall

There are two ways to recall a previous command line:

- 1) If you have a Digital VTnnn terminal or a terminal or personal computer that emulates a Digital VTnnn terminal, use the UP cursor key (↑) to recall the last command. You can recall the last 20 unique commands (not including successive identical commands, null commands, or the RECALL command). You can also use the DOWN cursor key (↓) in case you back up past the command line you need.
- 2) Use the RECALL command or type ^B at the command prompt when your terminal has no cursor keys and no CRT display. Use the VMS RECALL command to display either all 20 previous command lines, one specific command line (by its relative position number with the last 20 commands), or one of the last twenty command lines (by matching a few of the initial characters in the line). Type HELP RECALL to obtain further information.

2.3.2 Editing the Recalled Command Line

You may edit command lines with the command line editing feature which is enabled by default on the IPNS VMS computers. If you find that these commands do not work on your terminal, re-enable command line editing with the following SET command:

```
$ SET TERMINAL/LINE_EDIT
```

You should also select either the /INSERT or /OVERSTRIKE option on the SET TERMINAL command, depending on your preference. In INSERT mode, characters enter to the left of the cursor and do not replace existing characters on the line. In OVERSTRIKE mode, characters enter and replace the character at the cursor position. Use the DELETE key to delete the character to the left of the cursor.

You may edit a command line that you are entering and have not yet issued or a command line you have just recalled. On DEC video terminals or emulators the arrow keys are generally used for positioning the cursor within the command line. You can use CONTROL-key keystrokes to obtain additional line editing features and to substitute for cursor movement keys and/or Function keys that may not be available on your terminal keyboard. These keystrokes consist of typing a character while holding the CTRL key down. This is usually written as ^X where "X" is the character key.

The action of these keys is as follows:

<u>Keystroke</u>	<u>Action</u>
←	Move one character left
^D	"
→	Move one character right
^F	"
^H	Move to beginning of line
backspace	"
F12	"
^E	Move to end of line
linefeed	Delete Word to left of cursor
^J	"
F13	"
^A	Toggle Insert/Overstrike mode
F14	"
^U	Erase to Beginning of Line

2.4 VMS Logical Names

It is possible to define logical names which make it easier to refer to specific files or directories. Logical names can be defined once and not need to be defined again until the system is rebooted if they are defined with the “/system” or “/group” qualifiers. System symbols are defined during system boot by executing the file “sys\$manager:sylogicals.com”.

These logical names may be different for different nodes in a cluster, especially if the cluster contains a mixture of VAX and Alpha nodes. For example, the ANPNS6 “sylogicals.com” command file includes the following:

```
$ DEFINE/SYSTEM PNS_LIB UD5:[PNSLIB]
```

to make it possible to point to the libraries as PNS_LIB:. The Alpha computers use different executables, so the PNS_LIB definition is different on the Alpha systems.

It is possible to equate a logical name to more than one physical location by specifying a list for the second argument (separate list elements by commas). This is known as a Search List.

2.5 VMS Symbols

2.5.1 Defining Symbols

VMS Symbols are abbreviations of text strings and are lost when you log out. Symbols may be defined in “SYS\$MANAGER:SYLOGIN.COM” or, at IPNS, “SYS\$MANAGER:SYSDEF.COM” if they are to be defined for all users, or in SYS\$LOGIN:LOGIN.COM if they are for your personal use. They may also be defined interactively. If the symbol includes an asterisk “*”, only the characters before the asterisk need be typed. An example of a symbol definition is:

```
$ FRE*E == "SHOW QUOTA"
```

```
$ E*DIT ::= EDIT/EDT/COMMAND=SYS$LOGIN:EDTINI.EDT
```

If only a single equals sign is used, the symbol will be deassigned when the current command procedure terminates. A colon before the first equal sign is equivalent to putting the right hand side in quotation marks.

A special kind of symbol is a **foreign command** definition. For a foreign command, the right hand side begins with a dollar sign and includes a directory specification. A foreign command can be used to provide input parameters to a program. An example of a foreign command definition is:

```
$ MPRINT:==$SD3:[MPRINT]MPRINT.EXE
```

After defining MPRINT, the command:

```
$ MPRINT LOGIN.COM
```

will allow the program, mprint.exe, to obtain the input filename, LOGIN.COM, from the command line and use it (for instance as the name of the file to be printed).

2.5.2 VMS Symbols at IPNS

Some non standard command symbols have been predefined. The following lines show some of these definitions. These commands are defined in SYS\$MANAGER:SYLOGIN.COM or SYS\$MANAGER:SYSDEF.COM.

```
$ WHO:==$PNS_LIB:WHO
$ H*OME:==SET DEFAULT SYS$LOGIN
$ UP:==SET DEF [-]
$ TPU:==EDIT/TPU
$ EDT :==EDIT
$ TRA*NSFER_RUNS:==RUN UD0:[TROUW.COM]TRANSFER_RUNS
$ CLS:==TYPE PNS_LIB:CVS.TXT          ! Clear screen
$ ACCP*LOT:==RUN UD1:[HITTERMAN.IPNSRUNS]ACCPLOT
$ CPU:==MONITOR PROCESS/TOPCPU
$ QUE:==SHOW QUE/ALL/DEV
$ BAT*CH:==RUN PNS_LIB:GETQUE_BATCH
$ MYTERM:==@SYS$MANAGER:MYTERM
$ RUNPLOTG:==RUN PNS_LIB:RUNPLOTG
$ EASYP*LOT:==RUN UD1:[HITTERMAN.EASYPLOT]EASYPLOT
$ POST11:==RUN UD5:[DISSPLA.CADIS110.DISMOD]POST11
$ POSTGKS:==PNS_LIB:GKSPOST
$ REWIND:==SET MAGTAPE/REWIND
$ WA*TCH :== SHOW PROCESS/CONT
$ T*YPE == "TYPE"
$ PUR*GE == "PURGE/LOG"
$ DEL*ETE == "DELETE/LOG"
$ LIB*RARY == "LIBRARY/LOG"
$ COP*Y == "COPY/LOG"
$ BACK*UP == "BACKUP/LOG"
$ REC*ALL == "RECALL"
$ calc:==$ud7:[dimm.calc]calc
```


2.6 VMS File Specifications

A particular file on a VMS disk is specified in the following format (the colon, brackets, periods, and semicolon are required delimiters):

```
node::device:[directory.subdirectory.etc]filename.type;version
```

Omit the "node::" portion if the file is on the computer you are working on. Our Router does not forward DECnet traffic unless it is in area 45, so not all DECnet nodes will be accessible this way. If the file is on a different computer in the same cluster you would use the cluster device name (node\$device:) or the logical name for the disk (e.g. UD5). The cluster device name might have a number (Allocation Class) before the dollar sign instead of a node name. The "device:" portion and/or the "[directory.subdirectory.etc]" portions would also normally be omitted if they are the same as your current default device and directory which can be changed with the "SET DEFAULT" command. You would also omit the version number if you want the latest version of the file.

Under VMS Record Management Services (RMS), files on a given disk are organized into a master file directory, "[000000]", main directories "[main-dir]", and sub-directories "[main-dir.sub1.sub2]". The main-directory is the highest branch of the directory tree and the subdirectories are referred to as lower branches of the directory tree. Only the system manager can create the master file directory and main directories. Each user creates sub-directories as desired to organize his files. The ellipsis "..." is a special "wild card" to refer to the lower branches of the directory tree. For instance, if your username is "ABC", you can obtain a directory of all your files with the command:

```
$ DIR [ABC...]
```

Another Special character is the dash (-) which can be used to refer to the next higher directory level. Special characters for version number include "0" for the latest version and "-1", "-2", etc. for previous versions.

There are a number of standard file types assumed by VMS. Some of these are:

VMS Standard File Types

name.DIR	a directory file. The version number is required to be 1. Directory files can only be created with the CREATE /DIR command.
name.FOR	FORTRAN source files usually created by the EDT or EVE text editors. These are "ASCII" files
name.MAR	VMS MACRO assembler source files created with a text editor
name.LIS	A listing file produced by a compiler such as FORTRAN when the /LIST qualifier is used. The TYPE and PRINT commands assume the LIS file type if none is given.
name.OBJ	Compiled object files produced by the FORTRAN or MACRO commands
name.OLB	Object library files containing a group of OBJ files. These files are produced and examined by the LIBRARY command. They may be included in the link statement if they are followed by the /LIB qualifier.
name.EXE	Executable files produced by the LINK command. The RUN command can be used to execute these files.
name.COM	Command files which contain a series of DCL commands and can be executed interactively by preceding the name by the "@" symbol or executed submitting the file to a batch processing queue.
name.LOG	An output log file created by a batch job. The default name of this file will be the name of the command file submitted to a batch processing queue.
name.TLB	Text library files which could be FORTRAN, MACRO, or other files.
name.HLP	Help source files created with a text editor for insertion into a help library.
name.HLB	Help library files created using the LIBRARY /HELP command. These usually are kept in the directory referenced by the logical name SYS\$HELP.
name.OPT	Linker option files used to group together a set of files and/or libraries for inclusion in a LINK command using the /OPT qualifier.
name.MAI	A VMS mail file. These are only accessible by the

	owner and can only be read through the VMS MAIL utility.
name.JOU	A journal file created by a text editor which contains a record of the keystrokes entered while editing a file. These disappear when you exit the editor normally. They are used as input when you use the EDIT/RECOVER feature.
name.BJL	A Backup Journal file created by the Backup utility as a means of preserving a record of files backed up. These can only be read by the Backup utility.
name.DAT	A data file created by program output or used as program input. For instance writing to Fortran unit 1 without specifying a file name would create file FOR001.DAT.
EDTINI.EDT	A file used as a startup file to customize the EDT text editor. The logical name EDTINI is usually used to specify this file.
name.SYS	A special system file such as a disk QUOTA file, a SWAPFILE, or a PAGEFILE.
name.CLD	A command line definition file used as input to the Command Definition Utility.
name.RNO	An input file for the Digital Standard Runoff (DSR) Utility.
name.MEM	A document file created by DSR.
name.TMP	A temporary file. For instance when you edit a file "name.FOR" the editor creates file "name.TMP". Upon successful completion the output file would be renamed to "name.FOR". If the editor is aborted abnormally the temporary file is kept and can be used to recover changes to the file being edited.

Other Standard File Types

name.RUN	An IPNS run file containing raw neutron scattering data.
name.DOC	On a VMS computer, a documentation file. On a PC or Mac, a Microsoft word document.
name.PS	A Postscript file which can only be printed on a Postscript printer.
name.000	A MASS11 Folder file containing a directory of all files in MASS11 folder called "name". The first document in this folder will have a file name of "name.AA0". Succeeding documents in the folder will be differentiated by their file types which increment automatically from ".AA0".
name.TEX	A TEX document preparation program input file.
name.DVI	A Device Independent file created by the TEX program.
name.FMT	A format file used as input by the TEX program.
name.INP	A "card image" (i.e. 80 column ASCII) input file used by the IPNS RIETVELD procedure batch jobs.
name.HKL	"Card image" file of Bragg reflections, produced by TOFLZY (LZ) as part of the RIETVELD analysis procedure.
name.PUN	"Card image" file containing refined parameters, produced by TOFLS (LS) and used by UPDATE (UP) as part of the RIETVELD procedure.
name.INC	1) "Card image" file containing a measured incident neutron spectrum, used optionally by TOFPRP (PR) as part of the RIETVELD procedure. 2) A file to be included in a FORTRAN program with the INCLUDE statement.

An asterisk (*) "wild card" character can be used to represent all or part of the file name, type, or version number. Examples of use of filename wild cards are:

\$ DIR *.FOR (i.e. anyname.FOR)

\$ DIR AB*.* (i.e. ABanyname.anytype)

A file name can be up to 39 characters in length, chosen from A through Z, the numbers 0-9, an underscore (_), a hyphen (-), or a dollar sign (\$). Do not use a hyphen (-) as the first or last character of a file name. Do not use a dollar sign (\$) as the first character of a file name. The file type is optional and is also allowed to be up to 39 characters long, but it is recommended that file types be kept relatively short and that they conform to the above standards.

To execute a command file interactively, type the "@" character followed by the command file name.

2.7 Printing Files

There are a number of printers available at IPNS. You can determine what print queues are available on your node by typing:

```
$ SHOW QUE/DEV
```

You can print on the chosen print queue with the command:

```
$ PRINT/QUEUE=que_name file_spec
```

where "que_name" is the name of the print queue and "file_spec" is the specification for the file to be printed. You can modify the way the printing is done by including a FORM qualifier on the print command. To see what forms are available you can type:

```
$ SHOW QUEUE/FORM/FULL
```

If there is a setup file it is only applicable to one type of printer and cannot be used on another type of printer. The setup files do such things as choose fonts and landscape or portrait orientation, or they may put the printer into a graphics mode. You cannot print text files on a Postscript printer unless they have been put in the proper format by such programs as TEX or MASS11, or they are controlled by a special print symbiont such as the Pathworks for Macintosh software.

2.7.1 Choosing a Printer From a Menu

To simplify the choice of printer and print form for different types of files on different types of printers, you can use the **MPRINT** command followed by the file name. MPRINT will examine your file to determine the file type, then display a list of printers that can print this file properly. When you choose a print queue from the menu, MPRINT will compose and execute a print command with the proper forms qualifier to print the file.

2.7.2 IPNS Print Forms

A print form is used to set up a printer for certain margins, lines per inch, characters per inch, etc. At IPNS these forms are different for Postscript and non-Postscript files. The non-Postscript laser printers have a number of forms in common. They are:

LETTER	For normal text in Portrait mode
LISTING	For 132 column text (either Portrait or Landscape)
LNLAND8	For 132 column text in Landscape mode
TEK	For Tektronix on an LN03-plus printer

For Postscript printers connected through Pathworks for Macintosh, the forms are:

LTR_10	Convert text file and print at 10 characters per inch.
LTR_12	Convert text file and print at 12 characters per

inch.

LPT_PLAIN Convert text file and print in landscape mode.

LPT_GRAY Like LPT_PLAIN + add gray bars every three lines.

PS_PLAIN Print Postscript file.

These forms are furnished by DEC with the Pathworks software.

2.8 Graphics on the VMS Computers

There are a number of choices for developing graphics programs on the IPNS VMS computers. For new programs, we recommend the use of PGPLOT unless you require some of the special functionality of IDL. PGPLOT is a public domain graphics package from Cal Tech. PGPLOT can be installed on any node upon request since it is public domain software and runs on both the Alpha and VAX systems as well as UNIX systems. PGPLOT documentation is available online by following the link "Software of Interest in Neutron/Photon Research" from the Neutron home page (see the chapter on Networking).

On the VMS systems, basic PGPLOT routines are automatically linked if your program calls them. There are also some DISSPLA emulation routines written for PGPLOT which can be linked by including "PGPLOT_DIR:PGPLOT/OPT" in your link statement.

Argonne and IPNS originally used CA-DISSPLA graphics routines for plotting data, etc. This package was very expensive, so was only purchased for node ANLPNS. CA-DISSPLA is still available, but we do not recommend it for developing new programs. You can link to the DISSPLA graphics library by including "DIS11/OPT" in your link statement.

On most of our VMS nodes, we also have DEC-GKS graphics software and a library of routines called GPLOT which was written to emulate some of the DISSPLA routines. You can link to GPLOT graphics by including GPLOT/OPT in your link command. GKS supports Motif/Xwindows, VT240, Tektronix terminals, Tektronix hard-copy, LJ250 Inkjet printer, the HP7550A pen plotter, and Postscript devices. See the Graphics chapter for more details. Documentation for DISSPLA and GPLOT are available from Tom Worlton.

2.9 VMS Batch Queues at IPNS

The batch queues on the IPNS computers are a shared resource, which means that the available computing time will be split among all jobs in the queue. If four 1-hour jobs are submitted simultaneously they will run simultaneously and output will not appear for any of the jobs for about four hours. If the same four jobs were submitted sequentially, output would appear from the first one after about an hour and they would still all be completed after four hours. Thus there are some advantages to limiting the number of concurrent batch jobs. Users can control the order of execution of their jobs by using either the "SYNCHRONIZE" or the "SUBMIT/AFTER=time" command. The contents of the HELP SYNCHRONIZE and SUBMIT/AFTER files are included as sections 3.1 and 3.2

Each user may have no more than two active batch jobs per computer. There are batch queues running on all of our cluster machines. The queue names are available by typing the command:

```
$BATCH
```

at the DCL prompt.

Each machine has at least three queues:

<code>SY\$BATCH</code>	2 minute CPU time Limit
<code>node_MEDIUM</code>	20 minute CPU time Limit
<code>node_LONG</code>	2 hour CPU time Limit
<code>node_SLOW</code>	No time limit

where "node" is the name of the node where the job is to be run. Since we now have a mixed cluster with an Alpha system and VAX systems, you must be careful to submit your job to run on the node(s) which run that software specified. There will be two versions of some of the commonly used programs, one for VAX systems, and one for Alpha systems.

These time limits are based on the VAX 11/780 processing speed (1 VUP). The queue time limits may be different for processors of different speeds. The speed of our processors is: MicroVAX 3500 and VAXstation 3200--2.8 VUP, VAXstation 3520--2.8 VUP per processor, VAXstation 4000 6.0 VUP, and VAXstation II/GPX--0.9 VUP. On clustered nodes the queue names are preceded by the node name. If the node name and dollar sign are omitted when referring to the queue, it is assumed to be on the machine from which the command is executed.

Examples:

`ANPNS1_MEDIUM`, on `ANPNS1::`

`ANLPNS_SLOW`, on `ANLPNS::`

2.9.1 SYNCHRONIZE

Places the process issuing this command in a wait state until a specified job completes execution.

Format:

```
SYNCHRONIZE [job-name]
```

```
Command_Qualifiers
```

```
/QUEUE=queue-name[:]
```

Specifies the name of the queue on which the job was entered or the queue on which the job is executing. If /QUEUE is not specified, the command assumes that the job is in the default batch job queue, SYSS\$BATCH.

```
/ENTRY=entry-number
```

Specifies the system assigned entry number of the job. By default, the system displays the entry number when it successfully queues a job for execution; the entry number job is also displayed when you issue the SHOW QUEUE command.

If you specify both the /ENTRY qualifier and the job-name parameter, the job name is ignored.

Example 1:

```
$ SUBMIT/NAME=M_CALC_ALL TBCI /QUE=SLOW
Job M_CALC_ALL (queue SLOW, entry 219) started on queue SLOW
$ SUBMIT PHASER /QUE=SLOW
```

The first SUBMIT command submits the command procedure TBCI.COM for execution and names the job M_CALC_ALL. The second SUBMIT command queues the procedure PHASER.COM. The procedure PHASER.COM contains the line:

```
$ SYNCHRONIZE M_CALC_ALL
```

When this line is processed, the system verifies whether the job named M_CALC_ALL is currently executing in SLOW. The procedure PHASER is forced to wait until the job M_CALC_ALL completes execution.

Examples 2:

```
$ SUBMIT/NAME=TIMER COMP.COM /QUE=SLOW
```

```
Job TIMER (queue SLOW, entry 214) started on queue SLOW
```

```
$ SYNCHRONIZE /ENTRY=214 /QUE= SLOW
```

In this example, a batch job named TIMER is submitted. Then the SYNCHRONIZE command is entered interactively. This command places the interactive process in a wait state until entry number 214 (TIMER) completes. You cannot issue subsequent commands from your terminal until the SYNCHRONIZE command completes and your process is released from the wait state.

2.9.2 SUBMIT/AFTER=time

Requests that the job be held until after a specific time. If the specified time has already passed, the job is queued for immediate processing.

You can specify either an absolute time or a combination of absolute and delta times. See Section 2.5 of the VAX/VMS DCL Concepts Manual for a description of the various date and time formats.

Examples:

```
submit/after=19-jun-1991:01:00
```

This job will run on June 19, 1991 at 1 AM.

```
submit/after="tomorrow+03:00"
```

This job will run at 3:00 a.m. on the day following the issuance of this command.

2.9.3 Job Cancellation

You can cancel batch or print jobs which you own with the command:

```
$ DELETE/ENTRY=number
```

The job entry number is reported to your terminal when you submit your job. If you have forgotten the entry number, you can find it by using the command:

```
$ SHOW QUEUE queue-name
```

You can also use the qualifiers /ALL, /BATCH, and/or /DEVICE to show the jobs in multiple queues.

For batch jobs you can also use the command:

```
$ SHOW SYS/BATCH/FULL
```

2.10 VMClusters

A cluster is a group of two or more processors that share some or all of their resources. When a group of VMS processors shares resources in a VMCluster environment, the storage and computing resources of all of the processors are combined, which can increase the processing capability, communications, and availability of your computing system.

A Local Area VMCluster is made up of one or more VMS processors that serve as the management center of the cluster, plus one or more VMS processors that are connected to this hub through Ethernet. A local area VMCluster always includes the following parts:

2.10.1 Boot Server

A boot server is a VMS processor which serves as the management center of a local area VMCluster environment. The system disk of the boot server contains management files for the entire cluster, including startup files, the boot server's system disk, user authorization information, and the capability of letting other processors join the cluster. A boot server must be available and running for the cluster to operate. Currently all the nodes in the clusters are boot servers.

2.10.2 Satellite Nodes

A satellite node is a VMS processor that is a member of the cluster, but does not have its own system disk. IPNS currently has no satellite nodes.

A major benefit of a VMCluster configuration is the ability to share resources. A shared resource is a resource (such as disks, tapes, or queues) that can be accessed and used by any node in a cluster. Data files, application programs, printer queues, and batch queues are just

a few of the items that can be accessed by users on a cluster with shared resources, without regard to the particular node on which the files or program or printer might physically reside.

When accessing a disk or tape on a node in the cluster other than the node you are logged in to, you must use a logical name or include the node name or "allocation class" to refer to the device. The allocation class numbers for the IPNS cluster nodes are ANLPNS=8, IPNS=2, ANPNS1=1, and ANPNS6=6. For example the disk labeled "UD4" in the cluster can be referred to as DKA300: on node IPNS, but on other nodes in the cluster it must be referred to as \$2\$DKA300: or UD4:. We have defined logical names for the disks that are the same as the volume label and we encourage the use of these logical names (UD4) instead of the physical device names (\$2\$DKA300). The physical device name is determined by the controller hardware and is subject to change.

When disks are set up as shared resources in a homogeneous VMSccluster environment, users have the same environment (password, privileges, access to default login disks, and so on) regardless of the node that is used for logging in. You can realize a more efficient use of mass storage with shared disks, because the information on any device can be used by more than one node--the information does not have to be rewritten in many places.

Print and batch queues can also be set up as shared resources. In a VMSccluster configuration with shared print and batch queues, a single job controller queue file manages the queues for all nodes on the cluster. The job controller file makes the queues available from any node. For example the IPNS VMSccluster has fully shared resources and includes nodes IPNS, ANPNS1, ANLPNS and ANPNS6. A user logged in to node ANPNS1 can send a file that physically resides on a disk attached to node ANPNS6 to a printer that is physically connected to node ANLPNS, and the user never has to specify (or even know) the nodes for either the file or the printer as long as the disk is mounted on both nodes.

3. Computer Security

Security of computer equipment and software is the responsibility of every user. The Laboratory has appointed Jean Troyer as the Computer Protection Program Manager, and IPNS has appointed Tom Worlton as the Computer Protection Program Representative for the Division. Employees having personal computers will be responsible for compliance of their systems with the Laboratory Computer Security policies.

3.1 Password Protection

When you receive an account on an IPNS shared computer system you will be assigned an initial password. The first time you log on the system you will have to change this initial password to a new password of at least 6 characters. You can change the password at a later time through typing the command:

```
$ Set Password
```

The response will be:

```
Old Password   (Enter the original password)
New Password   (Enter the new password here)
Verify         (Reenter the new password)
```

All non-privileged passwords expire every 180 days and you will be required to select a new password at that time. A warning message will accompany system login when the password is about to expire. Passwords on privileged accounts expire every 30 days.

Protect your password and do not give it to anyone. Do not pick common words such as VMS, Mickeymouse, Eureka, etc. as some break in attempts use lists of these common words. Do not use your user account name for this same reason. If you make frequent use of a remote system or use an IPNS VMS system from a remote system, ask the system manager of the systems involved to create a proxy login account for you. This will prevent your password from being transmitted on the site-wide Ethernet where it is subject to view by Ethernet analyzers. Proxy logins are already set up for all accounts within the IPNS local area network.

If you must enter a password from your terminal for copying files, etc., be certain that the password is erased from the recall buffer before leaving the terminal. Otherwise someone

can come along and type "RECALL/ALL" and find the line containing the password. On VMS systems you can enter the command "RECALL/ERASE" to erase the recall buffer.

Some Instrument accounts have been set up for IPNS users of particular neutron scattering instruments to store and analyze neutron scattering data. Since the passwords for these accounts are shared among users they are being converted to "captive accounts" only allowed to run particular software.

3.2 File Protection

Access to your VMS files is determined by the User Identification Code (UIC) of the file owner and by the file protection mask for each file and directory. There are four classes of user (SYSTEM, OWNER, GROUP, and WORLD) and four classes of file access (Read, Write, Execute, and Delete). Only a few people who manage the computer systems have System privilege. The UIC consists of a pair of numbers. If both of your UIC numbers match the file UIC, you are the file owner. If only the first numbers match you will have Group access, and if you don't qualify for any of the other classes, you will have World access. You can change the file protection on a file you own with the command SET FILE/PROTECTION. For instance, if your main directory is [ABC], you can allow everyone to execute your programs, but not get a directory of them by the commands:

```
$ SET FILE [ABC]*.EXE/PROT=WORLD:E
```

```
$ SET FILE [000000]ABC.DIR/PROT=WORLD:E
```

System class users can generally bypass file protection. As a safety feature, directories are created without delete access for any class of user and as an added protection, a directory cannot be deleted even if the protection is changed unless it is empty.

3.3 File Import/Export/Backup

The commands ALLOCATE, MOUNT, BACKUP, and COPY can be used to store and retrieve files on tape. For more information, type "HELP" plus one of these commands or see the VMS Documentation set. BACKUP is more compact and efficient than COPY and should be used unless the institution where you are sending the tape does not have a VMS system. Tapes are available from Tom Worlton or the stockroom. An 8mm tape holds 2.2 GB in low density (Exabyte 8200 drive) or 5.0 GB in high density (Exabyte 8500 drive). A 6250 BPI tape holds about 0.14 GB (280,000 blocks) and a 1600 BPI tape holds about 0.035 GB (70,000 blocks). If the institution where you are sending the tape has 8mm tape drives, it is better to write your files to 8mm tape because of lower cost and much smaller size. It takes several minutes to initialize and mount an 8mm tape.

3.3.1 Devices Available

3.3.1.1 Cartridge Tape Drives

The IPNS VMS cluster has five 8mm tape drives and two 4mm (DAT) tape drives. Two of the 8mm drives are in an automatic tape loader. The other 8mm tape drives are available for general use. TEST1\$MUB0: is an Exabyte 8200 drive (~ 2.2 GB). The other 8 mm drives on the cluster are Exabyte 8500 drives. When using these drives, remember that they are quite slow to initialize and mount. ANLPNS and TEST1 have TK70 cartridge tape drives, MUA0, which hold ~0.3GB. One of these is used for incremental backups, software installation, and importing files from TK50 tapes. One 4mm tape drive (a DDS1 drive) is in the DEC Storaeworks cabinet attached to ANPNS1, an Alphastation. The other 4mm drive (a DDS2 drive) is in the built-in Storaeworks enclosure on node IPNS, and Alphaserver.

3.3.1.2 Juke Box Library/8mm Cartridge Tape Drives

IPNS has a Juke Box Library system (JBL 125) which holds fifty-four 8mm tapes, two 8mm tape drives and robotics for loading and unloading tapes. Slots 1-20, and 41-54 in the tape carousel are currently reserved for system backups and archiving. Other slots are assigned to the neutron scattering groups for archiving data. A display on the front of the JBL displays which tape is loaded for each drive. Once a tape has been loaded, it cannot be unloaded until it has been mounted and dismounted. Mounting a tape takes two to three minutes, so be patient. Commands to the JBL 125 robotics can be issued remotely using "JBL commands" from ANLPNS. The following "User" commands are available:

JBL Online - put unit online
JBL Off-line - take unit off-line
JBL Drive <drive>- return info about <drive>
JBL Map- return map of slot contents
JBL Load <drive> <slot>- load <drive> from <slot>
JBL Unload <drive>- unload <drive> to original slot
JBL Slot <slot>- return inf. about a slot
JBL Sense- return sense data (interpret last error)
JBL Tag- tag tape in the specified slot
- with one character label

In the JBL commands, "<drive>" is either "A" or "B" and "<slot>" is the slot number. Drive A is MUB0: on ANLPNS and drive B is MUB1: on ANLPNS.

The following example shows how the tape in slot 21 can be loaded into drive "B" remotely and then mounted, used, dismounted, and unloaded:

```
$ SHOW DEVICE MUB1:
$ JBL Online
$ JBL DRIVE B
$ JBL LOA B 21

$ MOUNT/FOR MUB1:
.
.
.
$ DISMOUNT MUB1:
$ JBL UNL B
```

§

To remove tapes from the carousel, make sure no tapes are loaded then issue the command "JBL OFF". When the JBL is off-line, open the top cover, lock the tapes in place by turning the plastic dial to "SECURE", and remove the carousel. Place the carousel on a flat surface before unlocking the carousel to access the tapes. After replacing tapes with blank tapes, turn the dial back to "SECURE", reinstall the carousel, turn the dial back to "ACCESS" and issue the command "JBL ON". It will take a few minutes for the JBL to come back online since it automatically checks all carousel slots before coming online.

3.3.1.3 9-Track Tapes

There is a nine-track 0.5" tape drive attached to node TEST1 in the Bldg. 360 computer room of the IPNS Control Room which is part of the cluster. You can read old 9-Track tapes by using this drive which is device MUC0. Please **do not write** any 9-track tapes since this drive will not be replaced when it fails.

3.3.2 System Backups

In order to minimize loss of files through accidental deletion or hardware failure, regular backups of files are written to magnetic tape. Full backups record everything on the disk, while incremental backups just record files which have been created or modified since the last full backup.

3.3.2.1 VMS Cluster Nodes

Full backups of the disks on the IPNS cluster are done monthly and incremental backups are done weekly the rest of the month. These backups are recorded on the 8mm drives in the Juke Box Library on ANLPNS, MUB0 and MUB1, or on a 4mm tape drive on IPNS or ANPNS1. It is possible to restore individual files from these tapes, but this is very slow and these full backups are primarily intended as insurance against disk failure.

3.3.2.2 VAXstations

The Instrument VAXstations used for data-collection are backed up using an Exabyte 8200 8mm tape cartridge drive. The procedure WSBACK.COM in directory SYS\$BACKUP can be used to do a full backup. The file WSBACK.DAT is read by this procedure to determine the device designation of the tape unit and of the disk drives to be backed up. The owners of the individual workstations are responsible for doing their own backups. Full backups should be done weekly and they can be submitted as a batch job to run in the evening.

3.3.2.3 Macintosh Computers

The Macintosh computers are backed up weekly to a 4mm DAT tape in Rick Goyette's office. The Macintosh computers must be left turned on at night to enable the backup operation.

3.3.2.4 Windows Computers

The PC computers are backed up weekly to a tape drive on the IPNS Windows NT Server. This is scheduled by Merlyn Faber and usually occurs every Wednesday evening. In case of a loss of files on a PC, contact Merle Faber for restoration.

3.4 Sensitive Applications

A sensitive computer application is an application that requires a degree of protection because of its sensitive data or because of the harm that could result from improper operation or deliberate manipulation of the application (e.g. payroll, personnel, proprietary code, DOE energy code, reactor control code, loss in excess of \$100K).

Those managing a computer application on one of the laboratory computers must fill out a "Sensitivity Questionnaire" to assess the sensitivity of the application. If the application is sensitive, the computer system containing the application also becomes sensitive. If the application is sensitive, the user develops protection specifications for the protection of the physical media (such as tapes and printout) located at Argonne and for the protection of the application and its files from unauthorized access by other users of the Argonne computer.

3.5 Proprietary Computer Programs

Proprietary programs are computer programs acquired commercially by the Laboratory subject to restrictions regarding disclosure, reproduction, and unauthorized use of the proprietary information contained in the program. These computer programs are usually acquired by the Laboratory under a license and, although the details of each license vary, the improper use of such programs may expose the Laboratory to liability for violation of patent, copyright, trade secret, or other proprietary rights.

3.5.1 Proprietary Software at IPNS

Some of the proprietary computer programs at IPNS are: the VMS Operating System, DECNET, VMS Cluster, Terminal Server, DEC FORTRAN, DEC C, DEC GKS, MASS11, MASS11 Manager, DISSPLA, the NAG Library, and part of the TEX software.

3.5.2 Unauthorized Duplication and Use of Software

Unauthorized duplication and use of computer software is contrary to Laboratory and DOE policy and violates the U.S. Copyright Law. Unless otherwise specified in a license agreement, the funds used to purchase a software product represent a license fee for the use of one copy of the software product. Should the software be reproduced or duplicated without authorization, then the U.S. Copyright Law has been violated, making the infringement a Federal offense. Civil damages for unauthorized software copying can be as much as \$50,000, and additional criminal penalties such as fines and imprisonment can be imposed.

If you have a legitimate need for a commercial software product on a personal computer, it should be purchased through the Procurement Department. No other copyrighted software should be on your personal computer systems.

In some cases it is legal to use a copy of software purchased for your office computer on your home computer if the two will not be used simultaneously. Word Perfect explicitly states that this is legal. For other products, read the license agreement included with your software package.

3.5.3 Purchase of Computer Software

Only the Laboratory Procurement Department is authorized to obtain commercial computer software. Employees purchasing computer software without going through the procurement department will not be reimbursed for the expense. All Requisitions for procurement of computer software or hardware costing \$1000 or more must be accompanied by form ANL-489, "Computing Workstation Equipment, Software, and Peripherals Acquisitions Justification."

3.6 Physical Security of Computer Equipment

The Laboratory has experienced a rash of thefts of computer equipment. While IPNS has not lost any equipment, there have been thefts from Building 360. To protect our equipment, the Control Room is locked when Operators are not on duty, and all offices containing computer equipment should be locked when unoccupied for more than a few minutes. There is a combination lock on the Control Room door and authorized users may obtain the combination from Diane Hoffmann (360-L120; 2-6485) or Beverly Marzec (360-F109; 2-6555). In addition, certain people have keys to the other door to the Control Room and there will be a key in the F-109 Emergency Key Cabinet. There is also a card key reader on one door allowing those with card keys the ability to enter. The door with the card key reader will be open during normal work hours. Please do not block the doors open nor assume that someone else will close the doors after you have done so. The Control Room combination will be changed as needed.

As further protection against theft, some of our more valuable items of equipment have been secured with a locking device and efforts are underway to permanently mark our computer equipment to make it impossible to resell in case of theft.

3.7 Waste, Fraud, and Abuse Audits

Computer equipment and software purchased by Argonne National Laboratory, including all personal computer equipment and software, is to be used for official government business only. Computer files are subject to periodic, random, unannounced audits for waste, fraud and abuse. You should ensure that your computer contains only software purchased through proper channels and that your computer files are all work related. Use of your computer for running another business, displaying pornography, or using your computer in conjunction with any illegal activity are considered particularly serious offenses and could result in discipline or dismissal.

3.8 Reporting of Computer Security Incidents

Computer Security Incidents must now be reported. A person who believes a computer security incident has occurred on an IPNS Computer should immediately report the incident to the Computer Protection Program Representative (CPPR) for the Division (Tom Worlton) or to the Computer Protection Program Representative for the other ANL organization involved.

The classes of computer security incidents and their reporting requirements are listed below:

Minor	Unauthorized sharing of user verification passwords; attempts to access a system with little chance of success; inadvertent access to sensitive information; minor abuse of a system by authorized users (e.g. games and recreation). Must be reported to the CPPR for the system (Tom Worlton) and to the Director or Manager of the ANL program, Department, or Division (Bruce Brown).
--------------	---

Important

Major misuse or abuse of a system by an authorized user (e.g., using the system to support a personal business); penetration of system by unauthorized, non-ANL persons; deliberate access to or distribution of sensitive information; concentrated attempts to gain access to an ANL Computer System. Must be reported to the Computer Protection Program Manager (Jean Troyer), and to the ANL Chief Operations Officer (Ronald Teunis).

Significant

Deliberate destruction or unauthorized modification of sensitive or mission-critical data, or any incident that may result in loss, harm, or embarrassment to the DOE; criminal actions which may be prosecuted in the courts; incidents whose reporting could benefit other DOE installations susceptible to the same threats (e.g. security holes in major operating systems). Must be reported to DOE according to DOE-CH requirements.

4. Networking at IPNS

4.1 The Argonne Network

IPNS has a Local-Area Network (LAN) consisting of VAX-VMS, Alpha-VMS, UNIX, PC, and Macintosh computers plus printers and terminal servers all connected to one Ethernet segment. The IPNS LAN is connected to the rest of the Argonne network through a Cisco Router in Bldg. 360 (veronica.pns.anl.gov) which is connected to the ECT Hubnet. The Argonne network is connected to the Internet through a high-speed satellite link.

The IPNS Ethernet LAN allows high-speed communication between our various computers and allows for our different kinds of computers to print to a number of different printers without going through another computer.

For many years most networking was done with DECnet protocol, but we now recommend the use of TCP/IP protocol for all networking. Transmission Control Protocol/Internet Protocol (TCP/IP) allows remote login (TELNET), network file transfer (FTP) and electronic mail (SMTP) between computers of different types, including VMS computers, UNIX computers, Macintosh computers and computers running DOS or Windows if the appropriate TCP/IP software has been installed on that system. TCP/IP protocol is also used to access the World Wide Web.

Argonne has purchased a site-wide license for MultiNet, a software package that provides (TCP/IP) capabilities on VMS computers. We have installed this software on all IPNS nodes which allows all IPNS nodes to participate in the Internet, and allows many more users to gain terminal emulation or mail access to our computers..

4.2 Node Names and Addresses

Nodes on the Internet have an **Internet Address** such as “146.139.156.75”. To make it easier for humans to remember, they can also be referred to by the **Internet Node Name** such as “anpns1.pns.anl.gov”. To use the Internet Node Name instead of the Address, a **Domain Name Server (DNS)** must translate it to an address.

DECnet nodes have a separate name and number for the DECnet protocol. The DECnet node name can be no more than six characters long and the DECnet address has only two numbers separated by a period, with the first number being less than 64 and the second less than 1024.

UNIX, Macintosh, and PC computers have only an Internet name and address. For the IPNS VMS nodes, we have set the DECnet node name and the Internet node name to be the same, except that the Internet node name will need an additional subnet specification when being accessed outside of the IPNS subnet (pns.anl.gov). ANLPNS has been the traditional main node at IPNS, but it is the oldest and slowest of our nodes. We now recommend that when specifying an IPNS node to outside users, you use ANPNS1 or IPNS. The IPNS VMS cluster node names and addresses are:

DECnet		Internet	
Name	Address	Name	Address
ANLPNS	45.785	anlpns.pns.anl.gov	146.139.156.95
ANPNS1	45.808	anpns1.pns.anl.gov	146.139.156.99
ANPNS6	45.804	anpns6.pns.anl.gov	146.139.156.97
IPNS	45.788	ipns.pns.anl.gov	146.139.156.94
TEST1	45.768	test1.pns.anl.gov	146.139.156.96

Most of the DEC computers at Argonne are in DECnet areas 45 or 47. We no longer recommend using DECnet for wide area networking. Use TCP/IP tools (Telnet, FTP, SMTP, etc.) instead.

4.2.1 Finding the Internet Node Name and Address

There is a utility called nslookup which can be used to find the node name from the number or vice versa. On the VMS systems, this utility is furnished by MultiNet and can be executed with the command “Multinet nslookup” or just “nsl” on the cluster. The command is followed by a space and then the node name or number that you are trying to translate. The ANL network has nameservers to convert between node name and numbers. The nameservers we use are: “146.139.254.5” and “146.139.254.3”. Our Router is veronica.pns.anl.gov at address “146.139.156.1”.

4.2.2 Finding the DECnet Node Name and Number

The DECnet node number of a node you are logged into can be determined with the command:

```
$ SHOW NETWORK
```

The DECnet node names and numbers of other nodes can be determined from the Network Control Program (NCP). Within NCP, the “SHOW” command displays the currently defined values of parameters. The “LIST” command displays the values of the parameters recorded in the network database. To obtain a list of all known node names and numbers, enter the command:

```
$ MCR NCP show known Nodes
```

4.3 Testing the Network Connection

If you have trouble communicating, it is useful to be able to test the network yourself. This is usually done with the “ping” command. For our VMS systems, MultiNet furnishes the Ping command, so the command is “MULTINET PING” (except on the cluster we have defined “PING=MULTINET PING” so you can omit the word “MULTINET”). The ping command is followed by a space and the node name or number you want to test communication with.

Pinging will continue until you halt it with CTRL-Y on the VMS systems. A message is sent out regularly and when a reply comes back a line is written to your screen telling the time it took for the trip out and back. For local nodes, it should not be more than a few milliseconds.

4.4 Local Terminal Server Connection

All of the IPNS terminals are connected to terminal servers. These devices are connected directly to the Ethernet and allow you to log on to any VAX computer on the Ethernet from the same terminal. It also allows you to switch back and forth between computers with a single character. The terminal server is autobaud and can handle speeds up to 19.2 KBaud.

You begin login to a terminal server by typing RETURN. If no user name has been defined for the terminal, the terminal server will respond with an "Enter username:" prompt. No terminal server password is required at IPNS. The terminal server port username is used to identify the terminal location, not who is using the terminal. After entering a username (terminal location) you will be in terminal server local mode. In this mode you can connect to one of the VAX computers using the "CONNECT node" command.

Most IPNS Servers have been set up with ANLPNS as the preferred service and with the ^F as the forward key. This forward switch definition will enable you to change sessions by typing ^F without going through terminal server local mode.

To get back to Local mode press the BREAK key. If you want to log in to another node, press the BREAK key to return to Local mode, then type "CONNECT node". You can switch between sessions by typing ^F. There is a limit of four concurrent sessions on the terminal server. If the terminal you are using is in your office and you need to leave your desk you can return to Local mode and LOCK your terminal, but please do not do this if you are using a terminal in a public area and will be away for more than a few minutes. If you interrupt a session with the BREAK key, you can resume it later with the RESUME command.

Terminal servers automatically generate a list of services or computers they can connect to. Now that Argonne has a very large number of nodes, this can cause problems when one of our nodes is rebooted. The terminal server memory can fill up with other nodes while an IPNS computer system being rebooted is down and the desired service will be lost. The only way to reestablish the desired service is to increase the maximum number of nodes on the server and keep trying to connect to the desired service, or to reinitialize the server which causes the loss of all connected sessions. To prevent terminal server memory problems, access to nodes is restricted to two or three terminal server groups. IPNS uses service group 19, APS uses group 17, CHM uses group 13, and CTD uses groups 1-3. The default group for those nodes which have not changed is group 0.

4.5 Electronic Mail

You can use either VMS mail on a VMS computer or QuickMail on a Macintosh or PC to send and receive mail. For VMS mail we recommend using the VMS cluster instead of one of the data collection computers. On a VMS system, mail is started by entering the command "MAIL". You will be told the number of new messages in your mail folder and given a "MAIL>" prompt. Typing "HELP" at this prompt will give you full information about the use of the VMS Mail Utility.

QuickMail on a PC or Macintosh relies on the QuickMail server, which is a Power Macintosh computer in Bldg. 360, Room B201. Mail files for PC users are stored on the Windows NT server in B360 E221. If the NT server is rebooted, someone must respond to the error dialog on the QuickMail server or no further mail will be processed.

¹This operation requires that the terminal server user be privileged. It can be done from one of the ports on the same terminal server or it can be done remotely through the Network Control Program (NCP).

4.5.1 Defining an Email Alias

An Electronic mail address is of the form "username@anpns1.pns.gov", where "username" is the VMS username (except DECnet which uses the form "node::username"). Those users with personal computers can use their QuickMail address instead of their VMS address. If you want your VMS account to automatically forward your mail to your Macintosh or DOS computer, go into VMS mail and issue a command like:

```
MAIL>SET FORWARD - "SMTP%" "Bruce_Brown@qmgate.anl.gov" " "
```

Note that the entire address must be enclosed in quotes, so quotes within the outer quotes must be doubled to be kept. Use the command "show forward" within Mail to see how your mail forwarding is set.

Electronic mail addresses are now included in the phone directory and are available on the Web through the "Employee Directory" on the ANL home page (<http://www.anl.gov/>). Users are encouraged to use their Internet address in the phone directory listing.

The VAX Internet address and the Macintosh QuickMail addresses are more cumbersome than necessary. ECT has set up a **mail alias** system that allows you to use a simplified mail address. You can set this up yourself by sending electronic mail to the alias server. You provide the alias server with a nickname, a full electronic mail address, a control identifier (cid), and your full name. ECT suggests using your initials and last name as a nickname. ECT will use the control identifier to assure that no one else changes your mail alias. They suggest that you do not use your password as a control identifier, but it should be something that you can remember such as your mother's maiden name. The MAIL message requesting the alias would be composed as follows if your name were "John M. Carpenter" and your VMS username were "jmc":

```
To: smtp%"alias@anl.gov"  
Subject: cmd.add  
  
nick.JMCarpenter  
addr.jmc@anpns1.pns.anl.gov
```


cid.rhonda

name.John M. Carpenter

The text in italics should be replaced with text appropriate to you personally.

4.5.2 Sending Electronic Mail

Electronic mail may be sent using Simple Mail Transfer Protocol (SMTP) or by using DECnet and VMS mail protocols. Both protocols use the standard VMS Mail utility and the only difference is in the way outgoing mail is addressed (the "to:" field). We recommend using Internet mail instead of VMS mail if possible. An Internet mail address is of the form:

`smtp% "username@nodename" or ,`

`mx% "username@nodename"`

The DECnet mail address is simply:

`nodename : : username`

Users on other systems can use the address "username@anpns1.pns.anl.gov" to send mail to IPNS user "username". Our Internet address is 146.139.156.99. If the remote system does not have access to a nameserver with our node name, they can use the ANPNS1 Internet address enclosed in square brackets as follows:

`To: SMTP% "user@[146.139.156.99]"`

4.5.3 Mailing Lists

IPNS maintains a few mailing lists which allow people who are subscribers to send a message to all list subscribers by sending a message to a single address. The addresses of the

lists we maintain are: "IPNS-Staff@anl.gov", "neutron@anl.gov", and "NeXUS@anl.gov". To subscribe to any of these lists, send a mail message to the list address, but with "-request" after the list name (i.e. "IPNS-Staff-request@anl.gov") and put the word "subscribe" as the first line of the message and the word "quit" as the second line of the message. No subject is necessary. To unsubscribe from a list, follow the procedure for subscribing, but use the word "signoff" instead of the word "subscribe".

4.6 Login to Remote Computers

4.6.1 Telnet (Internet Protocol)

MultiNet can also be used as a terminal emulator to reach other systems including UNIX systems. The command is simply "Telnet" followed by the Internet address or Internet node name (if there is a Domain Name Server to translate the name to an address). For instance you could connect to the ANL system achilles.ctd.anl.gov with the command:

```
$ Telnet achilles.ctd.anl.gov
```

4.6.2 SET HOST (DECnet Protocol)

DECnet allows you to do remote login to other systems running DECnet software. The node to be accessed can be any node on the network including your local node, but it should be remembered that I/O operations incur additional overhead by going through DECNET, so this should not be used for long periods of time with I/O intensive applications. The VMS command which allows logging on to a remote DECnet node is:

```
$ SET HOST nodename
```

where "nodename" is the node name or node number of the node to be accessed.

To keep a record of your terminal session, include the /LOG qualifier in the SET HOST command. The file SETHOST.LOG will then be created and it will contain all your terminal IO during the session. If your VMS computer does not know about the remote DECnet node, you can still log in by using the node address formed from the two parts of the DECnet address. Take the first part times 1024 and add the second part to get a node number useable in the “SET HOST” command. For the system you are logged in to you can use DECnet address “0”.

4.7 The World Wide Web

The World Wide Web (**WWW** or **W3**) is a part of a world-wide group of computers (**nodes**) connected in a “network of networks” called the **Internet**. WWW refers to the computers on the internet which run special software to provide documents (**web servers**) or view and/or copy documents (**web browsers**). This software is able to provide or read documents containing embedded **hypertext** links which point to other documents on the WWW and allow the browser to jump from one document to another by clicking on a highlighted item--even though the documents are on different nodes. There may also be links to pictures, sound, and even video making it a **hypermedia** network. The WWW was started at CERN in 1989. The popularity of the Web really started to take off in 1993 when the National Center for Supercomputer Applications (NCSA) at the University of Illinois released a graphical interface, **MOSAIC**, for reading Web documents.

The computers in the WWW are connected through various physical connections such as Ethernet, leased phone lines, or satellite links. They use TCP/IP software protocols.

4.7.1 The Language of the Web

HTML (Hyper Text Markup Language) is the language used to create documents containing embedded links to other documents. The location of these documents is specified by their **URL** (Uniform Resource Locator). HTML documents contain embedded formatting commands which indicate different levels of headings, etc. They can also include references to graphics images and other objects. Hyper Text Transfer Protocol (HTTP) is used by browsers to jump from one Web document to another.

4.7.2 The Tools of the Web

The main tool for navigating or “**surfing**” the WWW is called a browser. When running a Web browser such as **Mosaic**, **Netscape**, or **MS Internet Explorer** you can jump to a specific location by entering a new URL such as “<http://www.whitehouse.gov>”. Web browsers keep track of where you have been and allow you to jump back to previous documents and then jump forward again as well as making direct jumps by clicking on highlighted phrases or entering new URLs. You can also view and/or transfer files using ftp through your browser if the Web server allows this. For an example of this, connect to the IPNS home page at URL “<http://www.pns.anl.gov>” and follow the links for “research proposals” and “downloaded”.

A **Hot list**, **Bookmark list**, or **Favorites list** is a list of references you have saved while using your browser because you think you may want to visit them again. You can go back to these references by clicking on the reference name in the Hot list or Bookmark list.

4.7.3 Starting your Web Browser

Netscape is the best browser for the Macintosh. If Netscape has been installed on your Macintosh, select “Netscape” from the Apple menu. Netscape should start with the IPNS home page. If it does not, enter the URL “<http://www.pns.anl.gov>”. Other Web pages we maintain are at “<http://www.neutron.anl.gov>” and “<http://local.pns.anl.gov>”.

Either Netscape or the Microsoft Internet Explorer can be used as a browser for the PC (Internet Explorer is free). If Netscape has been installed on your PC, select the “Netscape WWW Browser” icon from the Network folder or the Netscape folder.

For **VMS** cluster users, enter “**MOSAIC**” or “**MULTINET EMOSAIC**” at the VMS command prompt after setting your X Display location. (If you are not on the workstation console terminal, use the command:

\$ set display/create/node=nodename

4.7.4 Finding your way around the Web

If you have a **Macintosh or PC** and are **using the Netscape browser**, you can obtain information about any topic by selecting the “Net Search” button. You can obtain a list of topics to search with the “Yahoo” search engine by selecting “Net Directory” button and entering words to search for. For an even more thorough search, choose the DEC “Alta Vista” search engine which is also under the “Net Directory” menu.

If you are using **Mosaic on the VMS cluster**, you can get a list of servers by subject by choosing “Internet Starting Points” from the “Navigate” menu, and then selecting “Information by subject”. In the same starting points document, you can get a geographic list by selecting “Web Servers Directory”.

If a link does not respond, you can stop the connection attempt by clicking on the changing icon in the upper right hand corner of your browser screen, or by clicking on the “Stop” icon if your browser has one.

4.7.5 Multimedia on the Web

Mosaic or Netscape will allow you to view pictures in **GIF** (Compuserve) or **JPEG** format. With the help of external viewers you may also be able to listen to sound recordings in **.AU** (Sun Audio) format or watch and listen to movies in Macintosh **Quicktime** or **MPEG** (Motion Picture Entertainment Group) format. Of course to get sound you will need sound capabilities on the workstation or personal computer you are using. See “Hypermedia Examples” at “<http://www.eit.com/web/www.guide/>”.

4.7.6 Installing a Web Browser

You can choose from several different Web browsers. Mosaic was the original Web browser and is available free from the University of Illinois, NCSA. Netscape is the most popular and feature-rich browser which was originally available free, but now must be bought. Microsoft

has been working furiously to catch up and is giving away their Web browser, MS Internet Explorer. You can copy the MS Internet Explorer from our NT server or from the Microsoft ftp site.

Argonne has a site purchase agreement for Netscape licenses and keeps the latest available versions on the PC Public Volume. These applications are in a zipped file that requires a password to unzip. There are different passwords for the PC and the Macintosh versions. Contact Linda Clark of ECT to get the password and arrange to pay for the license.

Netscape for the Macintosh and the PC and Internet Explorer for the PC is also available on the "ipnsoft" volume of Tom's PC. For assistance in installation, contact Tom Worlton, Merle Faber, Rick Goyette, or John Hammonds.

To install Netscape on a Windows 3.x PC you must copy the file NS16-100.EXE to a temporary folder and double click on it to install Netscape.

For PC's running Windows 95 you can install Netscape 2.0 (n32e201.exe) or Microsoft Internet Explorer 2.0 (msie20.exe) by dragging the installation file to an empty folder and then double clicking on the file.

For the Macintosh, drag the Netscape folder to your Utilities Folder, add an Alias, then drag the Alias to the Apple Menu Items folder in the system folder of the Macintosh hard disk.

4.8 Remote File Access

4.8.1 Installing FTP Software

4.8.1.1 On a Windows Computer

There are a number of FTP packages available for Windows, Windows 95, and Windows NT, including one from Microsoft. The package we usually use is one called "ws_ftp" which is a public domain package available from our NT-SERVER in the ipnssoft area. For Windows 3.x, use ws_ftp.exe. For Windows NT or Windows 95, use ws_ftp32.exe. Copy the ".exe" file to a blank directory and then double click on it to start installation.

4.8.1.2 On a Macintosh Computer

4.8.1.3 Other

FTP software is included with all versions of the UNIX operating system. FTP is available on VMS systems through installation of optional DEC software, or installation of third party TCP/IP software. At Argonne, we have a license for Multinet from TGV and it has been installed on all VMS systems at IPNS.

4.8.2 File Transfer using FTP

Nodes which run TCP/IP software (such as MultiNet on VMS) can use File Transfer Protocol (FTP) to copy files from (get) or to (put) a remote system. FTP can be used between VMS, UNIX, PC, or Macintosh nodes if they are running tcp/ip software. Unless you have an account on the remote system, this must be done through an account with username "anonymous", and the remote node usually requests that you enter your own email address as a username. The following is an example of FTP file transfer (commands entered by the user are shown in bold).

```
$ ftp ftp.spc.edu
```

```
ANPNS6.PNS.ANL.GOV MultiNet FTP user process 3.2(106)
```

```
Connection opened (Assuming 8-bit connections)
```

<spcvxa.spc.edu MultiNet FTP Server Process 3.3(14) at Mon 14-Mar-94 5:53PM-EST

SPCVXA.SPC.EDU>**login anonymous**

<anonymous user ok. Send real ident as password.

Password:**tgworlton@anl.gov**

Welcome to the ftp.spc.edu software archive. Anonymous FTP is allowed 24

<hours/day, 7 days/week, except for system maintenance. There is no limit

<on simultaneous connections at this time.

<

<Your archive maintainers are: Terry Kennedy, terry@spcvxa.spc.edu, and

<Hunter Goatley, goathunter@wku.edu

<

<Please report any problems to one of the above email addresses.

<

<.1ST for further information. A listing of

<all available files is available in the file 0-README.INDEX.

<

<European users: A partial mirror of this site is maintained at the site

<nic.switch.ch in the /mirror/vms/spc directory. A partial mirror is also

<maintained at the site ftp.technion.ac.il in the directory /pub/unsup-

<ported/vms/spc.

<Guest User TGWORLTON@ANL.GOV logged into USER7:[ANONYMOUS] at Mon 14-Mar-94 5:5

7PM-EST, job 2020662b.

<Directory and access restrictions apply


```
SPCVXA.SPC.EDU>cd decus-archives

SPCVXA.SPC.EDU>mget aareadme.1st

<List started.

<Transfer completed.

<ASCII retrieve of USER7:[ANONYMOUS.DECUS-
ARCHIVES]AAAREADME.1ST;2 started.

<Transfer completed. 501 (8) bytes transferred.

SPCVXA.SPC.EDU>exit

<QUIT command received. Goodbye.

ANPNS6_TW>
```

(Not all of the output from the remote node has been included. “cd” means change to subdirectory. “mget” means get a file or group of files from the remote node. The default file format is ASCII. For executables, object modules, etc., issue the command "type binary" before the “mget” command.)

4.8.3 FTP from a PC

For file transfer using a PC running Windows 3.x, Windows 95 or Windows NT, we recommend the use of WS_FTP. WS_FTP is a shareware version of FTP which can be downloaded from the IPNS NT server by connecting to the "ipnssoft" shared disk area on the IPNS NT server (nt-server.pns.anl.gov). After connecting to this volume, select "winsock ftp 32". Copy the files from this folder to a temporary folder on your PC and then double click on the file "WS_FTP32.EXE" and ws_ftp will be installed on your PC.

4.8.4 File Access Using DECnet

Remote file access from one node to another is quite simple if both nodes are using DECNET with proxy logins enabled between the accounts on the two systems. It merely requires adding a node specification followed by a double colon at the beginning of the file specification and using the normal file access commands such as TYPE, PRINT, DIR, COPY, etc. The device and directory portions of the file specification are optional, but if not specified they will be taken as your default at login on the remote system. When accessing files on a remote node, a login is done on the remote node using your current username and password. If you have

trouble accessing a file on a remote node because of privilege, you can include a username and password of an account with access privilege in quotation marks before the double colon.

Since DECNET does an actual login on the remote computer you should make sure you have taken this into account in your LOGIN.COM file. At login there are three modes which can be determined by using the lexical function f\$mode within the login procedure. They are INTERACTIVE, BATCH, and NETWORK. You probably want to skip most of your LOGIN.COM file unless the mode is INTERACTIVE. It is especially important to skip any code requiring terminal input.

If you have an account with the same name on the remote node and Proxy Login has been enabled (The System Manager adds proxy login capabilities using the AUTHORIZE utility), DECNET should use your regular account on the remote node. Otherwise you will be logged into the default DECNET account which has few privileges and may be on the wrong disk. If you have a problem with file access from one system to the other, you can include your username and password for the other system in quotes before the double colon (this is not recommended since it transmits your password). For example, if you are currently logged on the node ANLPNS you can get a directory of files on node GPPD on your login device with the command:

```
$ DIR GPPD"username password"::
```

You can also include the node name in programs which access files so that the files only need to reside on one system, but they can be accessed by other nodes. You sometimes need to copy your files from one system to the other. For instance if you are logged on to node SAD you can copy all your FORTRAN files from directory [NAME.FOR] on node ANLPNS to your current default directory on node SAD with the command:

```
$ COPY ANLPNS::[NAME.FOR]*.FOR [ ]
```

You could then delete them from the remote node with the command:

```
$ DELETE ANLPNS::[NAME.FOR]*.FOR;*
```

You could also use the SEARCH Utility to find a file containing certain text on the remote node. For instance you could find all programs in the directory UD1:[PNSSRC.RUNLIB2] containing references to GETLNG with the command:

```
$ SEARCH ANLPNS::UD1:[PNSSRC.RUNLIB2]*.FOR GETLNG
```

If you wish to have simpler node names you can define them in your login command file. For instance, if your login command file contained the definitions:

```
$ DEFINE HEP "ANLHEP::"  
$ DEFINE PNS "ANLPNS::"
```

You could display a directory of your files on node ANLPNS with the command:

```
$ DIR PNS:
```

You can define other logical names to refer to specific directories on remote nodes. If you do not have an account on the remote node or Proxy Login has not been enabled by the System Manager, it will be necessary to include USERNAME and PASSWORD information in your command string. .

4.9 Dial-up Access from a PC

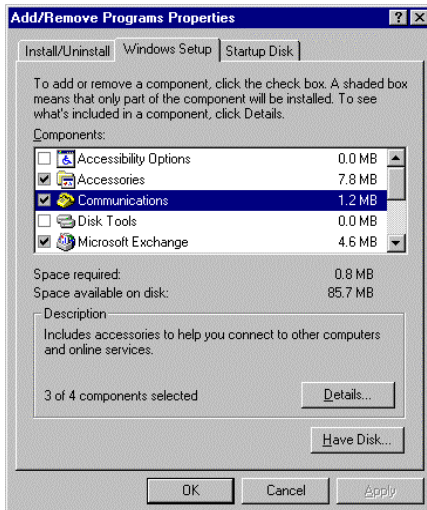
Personal computers running Windows 95 can take advantage of a service called **Remote Access Service** which runs on a Windows NT Server. This service allows you to connect to the internet using through a modem. Once dial-up networking is installed and configured correctly on your home PC, you can connect to the internet just by double-clicking on the icon for the Dial-Up Networking connection you have created.

4.9.1 Installing Dial-up Networking for Windows 95

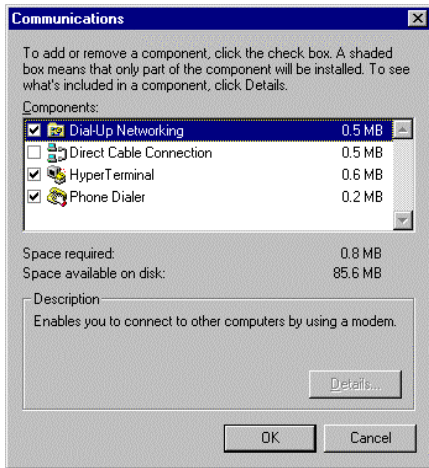
1. In Control Panel select “Add/Remove Program Option”.



1. Select “Windows Setup” tab, click on “Communications”, and then click “Details”.

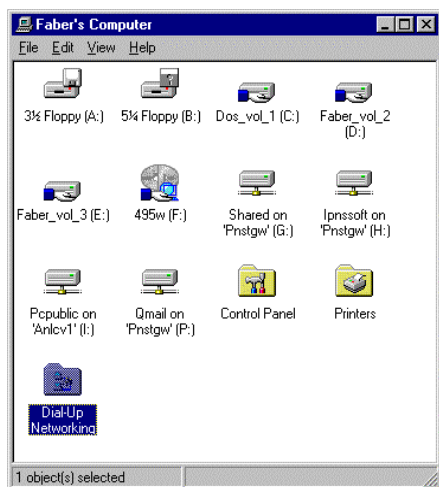


2. In the Communications dialog box select “Dial-up Networking” and then click “OK”.



4.9.2 Creating a Dial-Up Network Connection

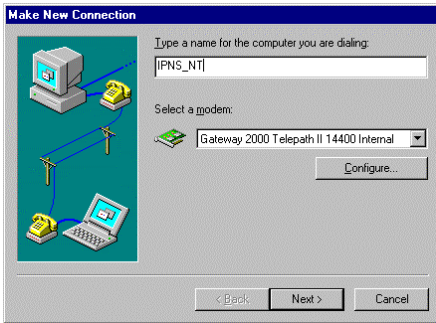
- Double-click the “My Computer” icon, then double-click the “Dial-Up Networking” Folder.



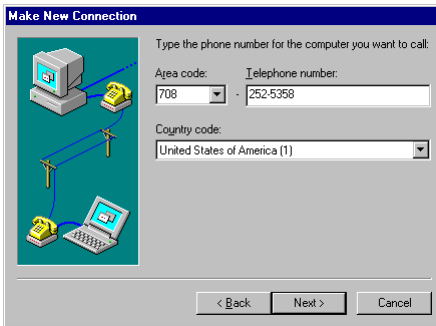
- In Dial-Up Networking double-click “Make New Connection”.



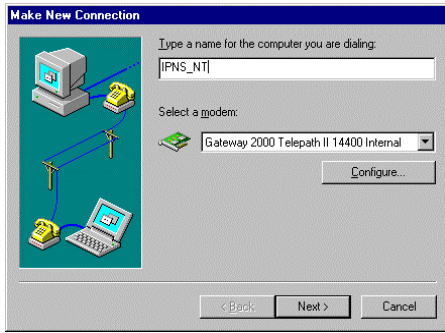
- Type in the name of computer you are dialing (IPNS_NT Server) and make sure the modem settings are correct. Then click on “Next”.



- Set the Area Code, if needed, then type in the server Telephone Number (252-5358 for the nt-server). Then select “Next”.



- Type in a name for your home computer (Jones_home). Then select “Finished”.

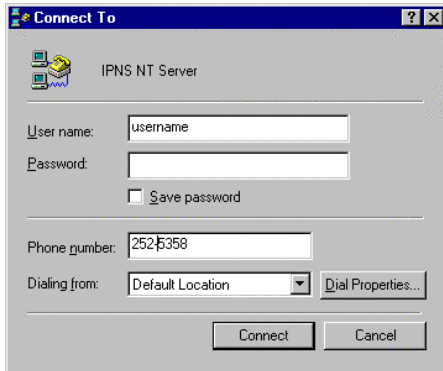


4.9.3 Using The Dial-Up Network Connection

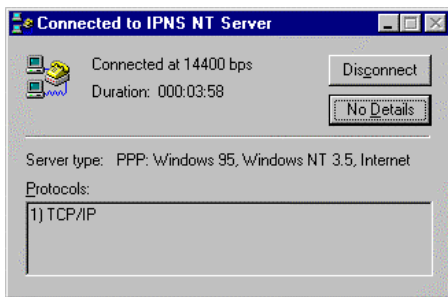
- Double-click on “My Computer” and in the Dial-up Network folder, double-click on the icon that you created. (For an even simpler connection, drag the icon “IPNS_NT server” to the desktop so you do not have to open “My Computer”).



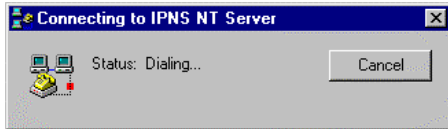
- Type in your User name and Password, then click on Connect. If you save your password, you will not have to enter it for future connections.



- The status screen will come up showing the dialing process.



- When connected, the status connection window changes to show connection speed and duration. Click on details to see the server type and protocols.



4.10 Dial-Up Access from a Terminal Emulator

4.10.1 Macintosh Terminal Emulation

The recommended terminal emulation software for the Macintosh is Versaterm Pro. Copies are available from Rick Goyette.

4.10.2 PC Terminal Emulation

The recommended terminal emulator software packages for the PC are KEA Term and Kermit. KEA Term is rather expensive so will only be provided to those who use this method regularly. Kermit is a public domain terminal emulation package which is free and also quite good.

4.10.3 Dialing In to the IPNS Computers

The IPNS computers can be accessed through a modem connected to one of our terminal servers or through modems connected to terminal servers maintained by the Argonne ECT Division. Some of these numbers provide several telephone lines which are in a hunt group so you only have to dial one number. Some numbers are a single line so are more likely to be busy. These lines are capable of 9600 baud communication if your remote modem follows the V.32 standard. In the unlikely case that all IPNS modem lines are busy or not working, you can access a terminal server at ECT which can connect to our nodes. The ECT modem numbers are 252-8700 for 2400 baud access and 252-8745 for 9600 baud access.. The Laboratory also maintains a Computer Callback Service which can be used by authorized persons to connect to the IPNS computers without paying connection charges. This service is only intended for Argonne Employees who live in the surrounding area.

The phone numbers for calling IPNS computer systems is:

708-252-7195 (9600/2400/1200 baud)

The phone lines for dialing in to our system are on terminal servers so that they can be used to access any of our computers. After your remote modem tells you that the connection has been made, press the RETURN/ENTER key at least twice to get the "Local>" prompt from the terminal server. You will then be able to connect to any of the DECNET nodes at the laboratory which are enabled on the terminal server. You are allowed two attempts to enter the correct password when logging-in to a DECNET node before the modem disconnects.

4.10.4 ANL 800 Number Callback Procedure

Using your Terminal and the Hayes Smartmodem, or Hayes Compatible Modem.

1. Be sure that the switches inside the cover or on the underside of your modem are properly set. Consult your modem manual for proper settings. (Note that some software programs may alter these settings during your session.)
2. If using a PC, start your terminal emulation software.
3. Set the communication parameters for your terminal or emulation as follows: 7 data bits, one stop bit, even parity, local echo on, and a baud rate of 1200, 2400 or 9600; for some modems, it may also be necessary to set a toggle switch on the modem to the desired baud rate.
4. Enter `ATS7=60` to extend the modem timeout setting to 60 seconds (rather than the modem default of 30 seconds). This extension will prevent the modem from prematurely hanging up while waiting for communication to be established. If you are using a 9600 baud modem, enter `AT$BA1` to defeat the speed conversion capability of the modem; the modem will take its baud rate from the terminal or emulation. This command should be reentered whenever the modem is powered down.

5. From your terminal or personal computer, enter the dial command ATDT if you have touch-tone service or ATDP if you have pulse-dial service (note that all commands to the modem must be in uppercase), immediately followed by the Callback telephone number (1-800-332-1478) and RETURN/ENTER. The modem will dial this number and connect you to the Computer Callback Service.
6. After your modem displays the CONNECT prompt on your screen, press the RETURN/ENTER key to get the attention of the Computer Callback Service. (If Callback does not respond immediately with a prompt, repeat pressing the RETURN/ENTER key until it responds.) Some modems will display a baud rate with the CONNECT prompt. If this baud rate is different from that set on the terminal or emulation, disconnect the session by either depressing the "ORG/ANS" toggle switch on the modem, then going back to step 5, or switching the modem off, then going back to step 4.
7. Respond to the Callback prompts for offsite telephone number and Laboratory computer extension. IPNS VAX users should specify the phone number for either of the IPNS modems as previously given or for the central VAX 8700 modem pool (252-8700 for 240 baud or 252-8745 for 9600 baud); for either of the IPNS numbers, obtain a password from the system manager. Central IBM computer users should specify the numbers 252-2212 for 1200 baud service or 252-2703 for 300 baud service. Users requiring more information may enter HELP in response to any of Callback's prompts. After all prompts have been answered, the Computer Callback Service will end the call, and call you back within approximately one minute.
8. While waiting for the call back, reset the communications parameters for the terminal or emulation, if necessary (e.g., if the desired baud rate for the upcoming computer session is to be different from that for communicating with the Computer Callback Service).
9. Users who prefer to use a telephone should follow step A below. Those who prefer to use the modem with its full auto-answer capability (connected to a phone jack without a telephone) should go to step B.
 - A. Both the modem and the telephone must connect to a phone jack. Note that switch 5 in a bank of switches usually inside the front cover or on the underside of the modem should be in the down position to disable the modem's "auto-answer" capability. When the telephone rings, answer the call. When you hear the carrier tone over the phone (this may take from 15-30 seconds), either depress the

"ORG/ANS" toggle switch or enter ATDT1 and press RETURN/ENTER to place the modem into "originate" mode; for 9600 baud modems, the ATDT1 command does not work, and thus, the "ORG/ANS" toggle switch must be used. Place the telephone handset back into the cradle.

- B. Those who are using the modem in "auto-answer" mode will hear the modem answer the Computer Callback Service. Press the RETURN/ENTER key. Immediately, enter ATDT1 and RETURN/ENTER to place the modem into "originate" mode, while you wait 30-45 seconds for the carrier tone from the computer you want to access. (If you receive a NO CARRIER response from your modem at this point, ignore the message.)
- 10. When you see the CONNECT prompt (with the proper baud rate, in some cases), press the RETURN/ENTER key. Again, if a prompt from the terminal server or computer to which you are connected is not obtained immediately, repeat pressing the RETURN/ENTER key until you are prompted.
- 11. Proceed with your login sequence.
- 12. To logoff, use the appropriate logoff, logout, or signoff procedure.

5. Word Processing at IPNS

IPNS has standardized on Microsoft Word on the Macintosh or PC for word processing, but still provides some support for other word processing methods. On ANLPNS we have a character based word processor, MASS11, which used to be our main word processor. There is also a graphical word processor on ANPNS6, DECwrite, which is very similar to Microsoft Word. DECwrite is only licensed for one user, and can only be accessed from X-windows terminals or workstations. It is also available on two of the DEC Ultrix workstations. Finally, the VAX cluster computers have two document production languages, TEX and Digital Standard Runoff (DSR), which use embedded commands for formatting, etc.

The MASS11 word processor allows you to see the document on the screen in approximately the same form as the printed output, but only uses terminal fonts. DSR is available on all VAX nodes and TeX is only currently set up on the cluster, but it can be transferred if necessary since most of it is public domain software.

5.1 Microsoft Word

Microsoft Word is available on all PC and Macintosh computers at IPNS. Licenses for MS Word are purchased by Rick Goyette for the Macintosh and Merle Faber for the PC. We buy these in academic 10-pack bundles. These give us just one set of disks and documentation per 10 licenses, so you may not have the manuals and original disks available. If you are in need of manuals, contact Rick or Merle. When importing or converting documents, the version of MS Word doing the import or conversion must be at least as high as the version used to create the source document. Another way around this is to have the computer which created the source document save it in the format of a previous version. At the present time, MS Word 6.0 is the recommended format for shared documents.

5.2 MASS11

IPNS still has a number of documents in MASS11, but we discourage any use of MASS11 for creating new documents. You can run MASS11 on ANLPNS by typing "MASS11" at the command prompt. A limited number of Mass11 Manuals are available. See Tom Worlton for a copy.

5.3 Document Conversion and Sharing

5.3.1 Conversion from MASS11

Documents which were originally written in MASS11 can be converted to MS Word using the conversion capabilities included in MASS11. When you have determined which MASS11 documents you want to convert, select the MASS11 Utilities menu, then the Document Conversion menu. Specify M11 (MASS11) as the input format and give the document name, then specify MSW (Microsoft RTF) as the output format and enter a new output file name. The RTF file should be readable by both Macintosh and PC versions of Word.

5.3.2 Conversion from other Word Processors

MS Word can read documents created by older versions of MS Word or by Wordperfect or Ami Pro simply by opening them like any other document. In order to do this successfully, the computer doing the conversion must be the most recent version of MS Word so it will be aware of the latest formats of the other word processors. After opening the old document on a PC, select the "save as" item from the "File" menu to give it a new name and document type.

5.3.3 Sharing Macintosh and PC Documents

The MS Windows NT Server software includes the capability to share files between Windows and Macintosh computers. There is a volume on the IPNS NT-SERVER called "Shared" which can be used for storing and retrieving files to be shared. Macintosh users can attach to this drive through the "Chooser" and PC users can attach to it through the "File Manager" or "Explorer". Any Windows NT directory which is intended for PC/Mac file sharing must be set up on the NT server to allow Macintosh access through the MacFile menu in the File Manager.

Windows 95 and Windows NT PCs can handle the long file names generated by the Macintosh, but older Windows PCs cannot, so until we are able to do a complete conversion to Windows 95 or Windows NT, all users should restrict shared folder names to 8 characters and file names of shared files to 8 characters plus a three character file type after the dot (these restrictions will disappear when all PCs are converted to Windows 95 or Windows NT). *Folder names should not end in a period and should not include spaces!* MS Word on a PC can open a document created by Word or WordPerfect on the Macintosh.

For the convenience of Windows PC users, Macintosh users should use the standard three character file type for application files. For instance, “.doc” for MS Word documents, and “.xls” for MSEXcel documents. It is also possible to use QuickMail to send documents between PC and Macintosh computers. Currently, MS Word 6.0 is the version to use for shared documents.

5.3.4 Portable Documents

In some cases, documents need to be shared with other users who may not be licensed to run the software which created the document. If the document is a Microsoft Word document, other users who have a PC running Windows or Windows 95 can view and print it without owning Microsoft Word if they have a copy of MS Word Viewer which is free for download from the Microsoft Web site (<http://www.microsoft.com/msword/Internet/Viewer/>). It is also available from our NT server on the “ipnssoft” shared volume.

If you only want to let people view or print documents, you can convert them to Adobe Acrobat format. Adobe Acrobat Viewers for PC, Macintosh, and UNIX platforms are available free from the Adobe WWW site. Acrobat is especially good for viewing and printing long documents. They are searchable and can include text, graphics, and can be in color. To convert a Postscript file to Adobe Acrobat format, put it in the directory \shared\acrodist\in\ on the NT-SERVER. The converted and original documents will be put in \shared\acrodist\out\ and you can move them from there to the desired location.

5.3.5 Postscript Printer Support

Most of the printers at IPNS have Postscript capability and it is recommended that Postscript be used for all output from word processors. Postscript printers are supported by MASS11, but Greek characters are only supported through down-line load of the QTCS character set. DECTEC scientific characters for Postscript (QTCS) are purchased from QMS and are

downline loaded into the printer, so whenever power to the printer is lost they must be reloaded by issuing the command "FONT_LOAD queue_name" from ANLPNS.

Postscript printers have variable point sizes which can be selected from the menu bar in MS Word or selected with the MASS11 embedded command, <fo=>.

In MS Word, italic or bold versions of fonts can be selected from the menu bar. In MASS11 you can get italics for most fonts by adding two to the font number. For instance, font 5 is Times and font 7 is Times Italic. To get bold face text in MASS11, use the PF3-B stroke sequence and then use PF3-N to go back to normal text.

Subscript and Superscript characters could be generated in older versions of MS Word by clicking on an icon in the tool bar. Later versions of MS Word do not include those icons on the tool bar, but they can be added by selecting "Customize" from the "Tools" menu and then selecting the "Format" category under the "Toolbar" tab. You then drag the superscript icon (x^2) and the subscript icon (x_2) to the toolbar containing text attributes.

5.3.6 TEX Document Production

TeX is a language for producing scientific documents, not a WYSIWYG word processor. TeX works through embedded commands and requires two compilation steps to produce a usable print file, but it is very powerful for writing papers with formulas. TeX knows that letters (variables) should be printed in italics and numbers in Roman type. TeX also allows for Greek letters and makes fractions and matrices easy to handle. TeX must be initialized before it can be used.

5.3.6.1 Initializing TEX

To be able to use the TeX processor you must enter:

```
$ SETUP_TEX [queue-name]
```

This will make several definitions and assignments necessary for using TeX. If you are a frequent user of TeX, you may put this command into your LOGIN.COM file. The queue name is optional but if not included, a separate SETUP_que-name command must be issued.

5.3.6.2 Downloading TEX Fonts

The printer queues must be initialized with the command:

```
$ INIT_que-name
```

This will submit a file that downloads fonts to the printer's memory. If the printer has been initialized and not reset in the meantime, the fonts will still be in memory and it will not need to be initialized. Do not attempt to print your TeX files until the font download has begun. The font file is rather long, and the probability of your job getting a higher priority and printing first is high.

5.3.6.3 Creating TEX Files

TeX files may be created with any editor that produces ASCII file output. TeX files should be saved with the extension ".TEX".

There are sample TeX documents in TEX\$SAMPLES. They may be helpful in learning the TeX language. For a complete introduction / tutorial / reference manual you may obtain a copy of "The TeX Book" by Donald E. Knuth from ECT Division in Bldg. 221.

5.3.6.4 Processing TEX Files

There are two steps in printing a TEX file. First the file is converted to a "device independent" file with the extension ".DVI", then it is converted to a printable file for a particular printer and sent to the printer.

5.3.6.5 TEX Print Queues

The following print queues may be used to produce TEX documents at IPNS:

HP4SI		The Hewlett Packard Printer in 360-L120
-------	--	--

		(by Diane's office)
DP1260	The Data Products Printer in 360-L134	
DP960	The Data Products Printer in 360-E101	
AST		The AST laser printer in Helen's Office.
B223		The B223_LASER Talaris printer in Bldg. 223.

A simple example of the use of TEX follows:

```

$ SETUP_TEX DP960
$ INIT_DP960
$ EDT junk.tex
.
.
.
$ LATEX junk
$ DP960TEX junk

```

6. Mathematical Libraries

IPNS has two mathematical libraries--the CERN Library and the NAG Library. The CERN Library is a public domain library and NAG is a commercial library, so the CERN routines may be transferred, but the NAG routines may not. Documentation for both of these libraries is available in the Building 360 Control Room.

6.1 CERNLIB

Documentation for the CERN Library consists of a short write-up for most of these programs and is available in the Control room (Bldg 360, Rm E-101). Long write-ups for some of the programs are available from CERN. The following catalog of the library subroutines which have been installed on the IPNS VAX should serve as a guide to the short writeups.

To link to the shareable image of the CERNLIB, link to

CERNLIB/LIB

HBOOK and HPLOT are now part of CERNLIB. If you have programs which are explicitly linked using HBOOK/OPT or HPLOT/OPT as well as CERNLIB, they should be relinked to CERNLIB/LIB only.

Due to conflicts with subroutine names in HANDYPAK and HBOOK, programs cannot be linked to both shareable images HANDYPAK and CERNLIB. As a workaround for this problem, link instead to

HANDYPAK/OPT , CERNLIB/OPT

This will link you to the object libraries of the CERNLIB.

Additional information available:

Program Catalog

/ELEMENTARY FUNCTIONS

/POLYNOMIALS AND SPECIAL FUNCTIONS

/INTEGRATION, MINIMIZATION, NON-LINEAR FITTING

/INTERPOLATION, APPROXIMATIONS, LINEAR FTTING

/MATRICES, VECTORS AND LINEAR EQUATIONS

/STATISTICAL ANALYSIS AND PROBABILITY

/OPERATIONS RESEARCH TECHNIQUES AND MANAGEMENT
SCIENCE

/OUTPUT

/DATA HANDLING

/DEBUGGING

/QUANTUM MECHANICS, PARTICLE PHYSICS

/RANDOM NUMBERS AND GENERAL PURPOSE UTILITIES

/HIGH ENERGY PHYSICS, SIMULATION, KINEMATICS, PHASE
SPACE

/PARTICLE DETECTION, MEASUREMENT, RECONSTRUCTION

/STATISTICAL DATA ANALYSIS AND PRESENTATION

/MISCELLANEOUS SYSTEM-DEPENDENT FACILITIES

Special Usage Notes /EPDE1 /FOWL /FUMILI /LINSQ /MINSQ
/MINUIT /MINVAR

6.2 The NAG Library

The double precision (64-bit) NAG Library is available on ANPNS1.

Link your programs to the NAG library by the following link command:

```
$ LINK your-program, NAGLIB/OPT
```

The double precision library has routine names ending in 'F', e.g. D02BAF. The basic NAG Libraries on the VAX/VMS system are DOUBLE PRECISION. If you call a NAG routine which has its last letter 'F' then terms marked `//..//` should be interpreted as follows:

```
//real// - Double Precision (REAL*8)  
//basic precision// - Double Prec. (REAL*8)  
//complex// - COMPLEX*16  
//additional precision// - quadruple prec.
```

7. Graphics at IPNS

For most plotting at IPNS, we now recommend using PGPLOT, which was written by Tim Pierson of the California Institute of Technology Astronomy department. PGPLOT is a library of subroutines to plot graphics to a number of graphic devices. PGPLOT is free and is supported on a number of platforms, including VMS and UNIX. For more demanding graphics and where interactive selection of plot styles is needed, you can use IDL, which is available on our Alpha nodes and several of our UNIX nodes.

DISSPLA, GKS, and PGPLOT all start by calling a routine to open a graphics device and end with a routine to close the device and all plotting. We have written extensions to these packages to allow selection of the device from a menu and to allow automatic printing of plot files which are created. The recommended way to start and end plotting is with the statements “CALL GSTART” and “CALL GSTOP”. The exception is with PGPLOT when you are producing a grid of plots on a single page. In that case start plotting with the statement “CALL PGSTART(n,m)” where “n” is the number of columns of plots, and “m” is the number of rows of plots. In order to use these extensions, you must link to the IPNS graphics routines as well as the standard library. To do this, end your link statement with one of the following:

- `,dis11/opt` ! For linking to DISSPLA and IPNS extensions
- `,gplot/opt` ! For linking to GKS and GPLOT
- `,pgplot_dir:pgplot/opt` ! For linking to PGPLOT and IPNS extensions

The DISSPLA library is only available on node ANLPNS and the menu of graphics devices is hard-coded in the GSTART routine. You select a device by entering the item number from the menu.

The GPLOT menu uses DEC Screen Management (SMG) routines to produce a menu and you use the arrow keys to move through the menu, then the Enter key to select a device or devices. The GPLOT menu of devices can be customized by each user. Begin by copying GPLOT_SRC:GDINIT.DAT to SYS\$LOGIN:, then use the command EDIT_GMENU to remove, add, or modify graphics devices.

The menu routine for PGPLOT was written to be customizable by each user and only uses standard terminal emulation so it will be portable to other operating systems. On your first use of a PGPLOT menu, there will be no devices set up. You must start by selecting “s” to set up a device. After you have set up one or more devices, they can be selected by entering a number at the “Selection?” prompt or by entering “D” for the last display device or “P” for the last print device. The PGPLOT menu routine will remember the last 9 devices you have used and the most recently used device will always be number 1 on the menu.

When IPNS first started, we used Computer Associates DISSPLA as our primary tool for plotting data. DISSPLA was very expensive, so was only installed on one node. We found that a low-cost graphics package was needed to allow users to create graphics on their own computers, and most of our users did not have DISSPLA, so we chose DEC VAX GKS as a lower cost graphics library that has even lower cost runtime licenses available. DISSPLA is available on node ANLPNS. Full function VAX GKS (for program development) is available on all IPNS nodes.

Because IPNS had many routines written in DISSPLA, a library of routines called GPLOT was written at IPNS to simplify the use of VAX GKS. These emulate many DISSPLA routines and customize the graphics environment for our particular set of graphics devices and print queues. To ease the move to PGPLOT, a library of routines has also been written for PGPLOT. Some of these routines add functionality to PGPLOT and some just provide a different API which is similar to GPLOT/DISSPLA

A separate GPLOT manual is available. IDL manuals are also available and PGPLOT documentation is available on the World Wide Web at URL “<http://www.astro.caltech.edu/~tjp/pgplot/>”. See Tom Worlton for additional documentation.

7.1 Using PGPLOT Graphics

Programs written in FORTRAN or C can make use of PGPLOT graphics by calling the routines as described in the online documentation at the Web site mentioned above. It has the advantage of being free, available on all of our computing platforms, and having source-code available. A number of users have written extensions and some extensions

have been written at IPNS to simplify conversion of our DISSPLA or GPLOT graphics programs.

7.1.1 Linking to the PGPLOT Library

PGPLOT is set up so that the base PGPLOT library is searched automatically when you link your programs, so no additions are necessary to your link statement to use PGPLOT unless you are using IPNS extensions. If you are using IPNS extensions (see below) you should include ",PGPLOT_DIR:PGPLOT/OPT" at the end of your link statement.

The logical name "LNK\$LIBRARY_n" is used to define libraries to be linked automatically. The "_n" is omitted from the first library to be searched, and n increases sequentially from "1" for the rest. The PGPLOT library is "PGPLOT_DIR:GRPSHR/OLB". To make sure it is defined on your system, issue the command: "\$ SHOW LOGICAL LNK\$LIB*" and the command: "\$ SHOW LOGICAL PGPLOT_DIR".

7.1.2 PGPLOT Examples

PGPLOT demonstration programs are available in PGPLOT_DIR: and they have the names PGDEMOi.EXE where "i" is an integer between 1 and 12. On the VMS cluster the source code for these examples is in UD4:[PGPLOT.EXAMPLES]. These are FORTRAN files, but have a ".F" extension instead of a ".FOR" extension for UNIX compatibility.

7.1.3 PGPLOT compared to GPLOT and DISSPLA

The following tables compare GPLOT/GKS and PGPLOT functionality if you are using PGPLOT without the IPNS extensions. Note that GSTART and GSTOP are IPNS additions to the DISSPLA API.

7.1.3.1 Plot Setup

GSTART (or device call)	PGBEG (0, '?', nxsub, nysub)
----------------------------	-------------------------------

PAGE (xpage, ypage)	PGPAP (xpage, ypage/xpage)
AREA2D (xaxis, yaxis)	PGVSIZ (xleft, xright, ybot, ytop)
XTICK (nxsub) / YTICK (nysub)	PGENV (xmin, xmax, ymin, ymax, just, iaxis)
GRAF (xmin, xstp, xmax, ymin, ystp, ymax)	PGBOX (xopt, xstp, nxsub, yopt, ystp, nysub)
XNAME (lxname, ixname) YNAME (lyname, iyname) HEADIN (lhead, ihead, htmult, nlines)	PGLAB (lxname, lyname, lhead) (for multiple heading lines, see PGMTEXT)

7.1.3.2 Plot Termination

ENDPL (iplot)	PGIDEN PGPAGE
GSTOP	PGEND

7.1.3.3 Plot Primitives

MARKER (isym)	PGLINE (npts, xaray, yaray)
CURVE (xaray, yaray, npts, imark)	PGPT (npts, xaray, yaray, isym)
ANGLE (angle)	PGTEXT (xval, yval, lmess)
ALNMES (xjust, yjust)	PGPTXT (xval, yval, angle, fjust, lmess)
RLMESS (lmess, imess, xval, yval)	
MESSAG (lmess, imess, xpos, ypos)	PGMTXT (side, disp, coord, fjust, lmess)
BLPOLY (xaray, yaray, npts, frm)	PGPOLY (npts, xaray, yaray)
BLREC (xorg, yorg, wide, high, frm)	PGRECT (x1, x2, y1, y2)

BLCIR (xorg, yorg, radius, frm)	PGCIRC (xorg, yorg, radius)
VECTOR (xfrom, yfrom, xto, yto, ivec)	PGSAH (fs, angle, vent)
RLVEC (xfrom, yfrom, xto, yto, ivec)	PGARRO (x1, y1, x2, y2)
STRTP (xto, yto)	PGMOVE (xto, yto)
CONNPT (xto, yto)	PGDRAW (xto, yto)

7.1.3.4 Notes

PGBEG is a function, not a subroutine, so use the following statement.

```
IF(PGBEG(0,'?',1,1) .NE. 1) STOP
```

Normally you use PGBEG, then call PGENV and then PGLAB. Calling PGPAP may cause an extra page/screen.

in PGBEG, set nxsub, nysub=1 unless you want multiple plots on the page.

In PGENV, just =1 for equal x and y scales, just=0 for independent x and y axes

in PGENV, iaxis = 0 for box and axes with coordinates; iaxis=10,20,30 for xlog, ylog, or loglog axes.

PGENV calls PGBOX for some values of iaxis. PGBOX need not be called for the above values of iaxis.

PGARRO uses world (data) coordinates only, like RLVEC not like VECTOR.

IPNS extensions to PGLOT are not as extensive as the GPLOT extensions to GKS, partly because PGLOT is written at a higher level, so they are not as necessary and partly because GKS has a few features not available in PGLOT such as graphics segments which can be selected independently and simultaneous plotting on more than one device. The following table lists the DISSPLA/GPLOT routines which are included in the IPNS extensions to PGLOT.

7.1.3.5 IPNS subroutines added to PGLOT

AREA2D	NOBRDR	PHYSOR		
--------	--------	--------	--	--

CURVE				
DOT	DASH	CHNDOT	CHNDASH	SOLID
DOTGRID				
DUPLX				
ENDPL				
GRAF	XREVTK	XTICKS	YAXANG	
	YREVTK	YTICKS		
GRID				
GSTART				
GSTOP				
HEADIN				
HEIGHT	QHITE			
INTNO				
LEGEND	ADDLEG	ALNLEG	DELLEG	LEGNAM
	LINESP	MYLEGN		
LINES				
MARKER	GETSYM	INCSYM		
MESSAG	CHRMSG	ANGLE		
NEWCLR				
PAGE				
REALNO				
RESET	GPOP	GPUSH	GRACE	KBMAP
	XAXEND	YAXEND		
RLINT				
RLREAL				

THKFRM	FRAME			
XGRAXS				
XINT				
XINVRS				
XMESS				
XNAME				
XPOSN				
XREAL				
YGRAXS				
YINVRS				
YPOSN				

7.2 Using GPLOT (GKS) Graphics

DEC VAX GKS is an implementation of the GKS international graphics standard which provides support for many graphics devices: DEC Graphic terminals and X Window Terminals, Tektronix terminals/emulators, Hewlett Packard plotters using HPGL, and postscript plotters. GKS consists of quite low level calls, so a library of routines called GPLOT has been written to emulate many of the DISSPLA higher level calls and to customize the graphics interface. The most recent versions of the GKS documentation are available through Bookreader on VAXstations running Motif or DECwindows and on X terminals. Copies of the older DEC VAX GKS manuals are available in the user room. The GPLOT manual is available from Tom Worlton. Since many GPLOT routines emulate DISSPLA routines, the CA-DISSPLA manual is also useful.

7.2.1 Device Nomination

The recommended method of nominating a device when using GPLOT/GKS is to call GSTART. GSTART will interpret the logical names SCREEN and/or PLOTTER to

determine which device to use. If no valid device is selected through the logical names, GSTART will display a menu of available devices. If GSTART is used to nominate the device, successive plots will plot on the same device unless the logical names SCREEN and/or PLOTTER are deassigned, e.g.

```
$ DEASSIGN SCREEN
```

The use of GSTART to nominate your graphics devices has the advantage that the plots are printed automatically when you call GSTOP. However, if you still want to call the device nomination routines directly you can do so. The available calls are as follows:

<u>Device</u>	<u>Device Nomination Call</u>
GKSM	CALL GKSM
POSTSCRIPT	CALL POSTSCRIPT
HP7550	CALL HP7550
TK4014 file	CALL TK4014F
HDS/TK4014	CALL TK4014
VT330	CALL VT330
VT340	CALL VT340
VAXstation	CALL VAXstation
LA50	CALL LA50
LA75	CALL LA75

7.2.2 Linking to GPLOT/GKS

To link to GPLOT and/or the VAX GKS libraries (FORTRAN Binding) include the following in your link statement:

```
. . . ,GPLOT/OPT
```

7.2.3 Plotting GKS Metafiles

GKS Metafiles created using GPLOT routines are given the name GPLOT.GKSM. They can be plotted using the GKS metafile post processor written at IPNS. The command to run this program is:

```
$ POSTGKS
```

7.3 Easyplot

EASYPLOT is a program written by Dick Hitterman which is designed to be a "menu-driven" way of producing plots of data. Easyplot uses DISSPLA conventions, so a knowledge of DISSPLA and its calling formats is helpful, but not necessary to the first time user. EASYPLOT has also been converted to GKS using GPLOT. A particular plot option is selected from a displayed menu of numbered items and selection is made by typing the number corresponding to the item. A carriage return is taken as "0" and this usually means "Exit" from that menu.

EASYPLOT tries to keep as much information about your plot as it can on the screen at all times, but because there are more optional setups available than there is screen space not all plot parameters can be displayed at once.

Data for EASYPLOT is always input from externally created data files and is never input directly into the program through the keyboard. The input data is in "free format". Several IPNS programs can output data in EASYPLOT format, and small data sets can be created using a text editor. EASYPLOT has space for storage of up to five datasets with up to 8000 points in each dataset. When first called in for execution there will be no data displayed in any of the areas, and only a few default parameters will be set. The user must load the data from an existing disk file using an option (#5 for data or #8 for an

entire plot) selected from the Main Menu. See the following sections for information on selecting parameters and creating data files.

7.3.1 Alphabets

The user can select a default alphabet for the overall TEXT plotting. The function is selected in the Graphing Basics portion of the Main Menu.

Selection of 1) Default UPPER-lower allows the user to simply use the keyboard CAPS-LOCK and SHIFT key to type in the text in standard typewriter format.

Two special characters have been implemented: the ANGSTROM symbol by typing in the ^ (karat) symbol and the DEGREE symbol by the \ (backslash). These special symbols are not available in all of the fonts listed. They are both available in the DUPLEX and SWISSM fonts and the degree symbol can be used in others but not the angstrom.

Selection of 2) DISSPLA Mixed Alphabet allows the user the DISSPLA Mixed alphabet functions as defined below:

CALL MX1ALF('STANDARD','?')	? - switch to UPPER case
CALL MX2ALF('L/CSTANDARD','!')	! - switch to lower case
CALL MX3ALF('L/CGREEK','*')	* - switch to lower case GREEK style
CALL MX4ALF('MATHEMATICAL','&')	& - switch to the MATHEMATICAL style
CALL MX5ALF('INSTRUCTION','#')	# - switch to INSTRUCTION format
CALL MX6ALF('GREEK','@')	@ - switch to UPPER case GREEK style

In some cases these are not the easiest to use and the user may find it difficult to master their use, especially the INSTRUCTION set. However, the UPPER-lower case shifting is rather easy as is the GREEK.

7.3.1.1 Instruction Alphabet Examples

to obtain: Fd3m - ?F!D3M
 (? shifts to UPPER
 case, ! to lower)

to obtain: Zr₃V₃O -
 ?ZrLH.7!3#EXHX?V#LH.7!3#EXHX?O

—
 to obtain: 43m -
 P!4#E1.2VEX!3M
 (4 bar 3m)
 (P-set tab,
 E1.2-Elevate 1.2,
 V-draw line from tab to
 current position,
 EX-reset Elevation)

7.3.1.2 Math Alphabet Example

to obtain: $\Sigma\Pi\sqrt{\quad}$ (Sigma-Pi-Square Root Sign) one does:

```
&SMY?  
(& switches to the MATH set  
? switches back to standard)
```

To obtain the angstrom (Å) and degree (°) symbols:

```
d-space (^)      and      \Centigrade
```

7.3.2 Batch Mode

Below is an example of Submitting a Batch job to run EASYPLOT. This can also be run interactively. In this example the input control commands are included in the file.

```
$ SET DEFAULT UD0:[USER.DIRECTORY]  
$ IF "'F$MODE()'" .NES. "BATCH" THEN GOTO S2  
$!  
$! USE THE FOLLOWING TO TAKE INPUT FROM A FILE  
$!  
$! ASSIGN INC.INC SYS$INPUT  
$!  
$ ASSIGN NL0: FOR$TYPE  
$ S2:  
$ RUN UD0:[HITTERMAN.EASYPLOT]EASYPLOT  
5      (Data selected  
1      (Input of data selected  
[USER.DIRECTORY]NEWMVS2T.DAT (Name of disk file  
7  
2
```

```
0
0
$ EXIT
```

7.3.3 Data Input

Data Menu: Select:

- 1)Input DATA/HKL parms
- 2)List
- 3)Edit
- 4)Delete data
- 5) Change X-array values
- 6)List data file names
- 7) Create ASCII file from Curve data
- 0)Quit:

Data is assumed to be entered only from a disk file. This data file can be made with EDT and is in free format. There is only one restriction on the free format and that is the first line of a new set of data. The data type must be surrounded by single primes. ex. 'O' or 'E'. The data is terminated by a -999.0 in the last entry. 'O' means that the data is odd in its X values and 'E' means that it is even in its X increment. Data is entered in X and Y pairs unless the type is 'E' and then only the Y values are entered. There is a maximum of 5 data curves with 8000 data points allowed.

The 'T' data type allows the user to plot standard TOF type ASCII data files which are produced from RUNPLOT with the create data file option. This file must still conform in its first line but contains nothing more than the 'T' code and two sets of 0.0 data. The second line must contain the TOF start, TOF channel width and number of data points in the file.

The 'B' data type allows the use of error bars. See the Data Examples section for explanation of format.

Option #6 (List Data File Names) will help the user remember the file names of where the raw data originated.

Option #7 (Create ASCII file from Curve data) allows the user to recreate the original ASCII data file for review or editing.

7.3.3.1 Data Examples

'E' Format example (constant delta-X)

Column 123.....

```

'E'   20.25  1.45      X start, X incr
      1234      Y values
      1456      .
      1567      .
      1245      .
      -999      Terminator value
  
```

'O' Format example (non-regular X values)

```

'O'   0.0      0.0
      10.0      2.4      X val., Y val.
      12.4      3.567   .
      16.98 4.32      .
      11.23 2.45      .
      24.69  -2.1      .
      -999.0 -999.0   Terminator values.
  
```

'B' Format (error bars) example.

(The uncertainty is in the third column)

```

'B'   0.0  0.0
      10.0  2.4  .034      X, Y, Y Bar
      12.4  3.567 .056      .
      16.98 4.32  .102      .
      (etc.)      .
  
```

-999.0 -999.0 -999.0 (Note. Need 3 terminators)

'T' format (Time-of-Flight) example:

```
'T' 0.0 0.0
      5.   .008   1251
3905.  3899.  3808.  3873.  3730.  3766.  3738.  3733.  4632.
5476.  5108.  4698.  4268.  4010.  3936.  3855.  3849.  3751.
      3883.  3946.
```

etc.....

```
'T'   0.0   0.0
      1      1      550
12345.   12345.   12367.   12367.   12789.   12567
.....   13452.   23223.   24323.   and on and on.....
```

7.3.4 HKL parameters

A submenu is presented as follows:

```
Select: 1)Input HKLs   2)Font 3)Color 4)Size
        5)Plot/No plot 6)Drop markers/No drop
        0)Quit:
```

Option 1) will ask for input of an ASCII file name which contains a list of HKL's and time-of-flight data. This type of file is free format and follows the form of the TOFPRP output of the HKL's; in fact the easy way to produce this

file is to edit the TOFPRP output file and make a file containing only the list of HKL's wanted. The file looks like:

```

.      .      .      .      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .      .      .      .
26     1      3      1      1      24     5033.96     -64.3 199.2
10062.7     1.3096

27     1      2      2      0      12     6700.75     -72.9 223.4
11800.2     1.5357

28     1      2      0      0      6      7843.95     -99.2 252.0
16690.0     2.1718

29     1      1      1      1      8      7015.54     -114.1      259.1
19272.8     2.5078

.      .      .      .      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .      .      .      .

```

The titles of the columns are as follows:

```

NO.   CODE h     k     l     MULT SCF   HWL   HWU   POSN
D-SPACING

```

but only the following are currently used in the plotting:

```

h     k     l                               POSN

```

7.3.5 List Data

This LIST DATA option will list the data point by point contained in any of the 5 curves. The data is spread across the screen in three columns and one should use the SCROLL/NO_SCROLL key to start/stop the display on the screen.

At the end of the list there is an option to change a particular 'y' value. There is no option to delete a single or range of data. One would have to edit the original data file and read it again after deleting the original data from the curve area.

7.3.6 Edit Curve Area

This option of the DATA section will enable the user to change any of the curve parameters displayed except the number of points NPTS.

The TYPE parameter enables the user to select one of seven types of curve fitting routines. The last option; LSQFit is the only one that is not a standard DISSPLA option. This fit is a simple least squares fit of the data and the linear parameters are then printed on the screen for your use. Selecting this LSQ option will produce another curve in the curve area and will have the TYPE option displayed as LSQFit.

7.3.6.1 Markers

Marker symbols are selected by default to follow the DISSPLA manual. User selection is allowed by input of the ISYM number of the corresponding marker.

0	Square - Open	1	Octagon - Open
7	Square - with x	13	Octagon with x
2	Triangle up	8	X with hyphen
14	Square with triangle up	3	+
9	Diamond with +	15	Circle - Solid
4	x	10	Octagon with +
16	Circle - Open	5	Diamond - Open
11	Triangles up & down	17	Square - Open

6	Triangle - down	12	Square with +
18	Square - Solid		

Marker frequency:

>0	points connected, symbols every iMARKth point
=0	points connected, no symbols
<0	points not connected, symbols every iMARKth point

Markers can be enhanced (made darker-thicker), by use of the thickness option.

7.3.6.2 Plus or Times

+	This allows the user to add (or subtract) a constant to the data.
X	This allows the user to multiply (or divide) by a constant.

7.3.6.3 Program Output

Below is an example FORTRAN program for output in EASYPLOT form.

```

      DIMENSION A(10),B(10)
C
C   TEST FOR 'EASYPLOT' OUTPUT
C
      DO 10 I=1,10
      A(I)=I
10    B(I)=I*I

```

```

WRITE(3,*)' "O"   0.0   0.0' ! Writes FOR003.DAT, *=Freeformat
DO 20 I=1,10                ! double primes necessary around
WRITE(3,*)A(I),B(I)        ! the Alphabetic character.
20 CONTINUE
WRITE(3,*)' -999.0  -999.0' !Termination for EASYPLOT data
STOP
END

```

7.3.6.4 Editing

Titles, Labels and messages can be edited. A one line explanation of the standard VT100 keypad editing keys is printed. Not all of the keys are available for editing, only those listed.

An example of the one line displayed for the Titles follows:

```

Edit the Title text with Keypad: Next word, EOL,
Del Char, BLine, Arrows

```

BLine is the 0(Zero) key and places you at the beginning of the line. EOL places the cursor at the End of the Line.

7.3.7 Hints For Use

When starting to develop a plot it is much faster to use the default character set (CARTOG). Once the plot is set up and the curves are all characterized a better font can be selected for the final product.

Make use of option 8 and 10 (Restore and Save), don't start over each time you want to work on the same data.

Once a plot has been set up and saved, any subsequent data that uses the same general ranges may easily be displayed by restoring the saved plot, deleting its data and then reading in the new data.

7.3.8 IPNS Logo

This will implement George Ostrowski's subroutine to plot the IPNS logo.

The calling sequence is `CALL LOGO(xpos,ypos,scale)` where: `xpos` & `ypos` are the coordinates of the center of the logo scale = values from 1 to 10 with 1 being a 1 inch size square.

7.3.9 Legend

The legend area is by default titled with the word `LEGEND` and is within a blanked area surrounded by a frame. The font, character size and `x,y` position within the plot area can be set by the user. The legend area will contain either/or symbols and line pattern to identify the data curve. If color is used to differentiate the data curve the legend will also.

7.3.10 Messages

Up to 5 message text strings can be defined. They may be up to 80 characters in length, but should be kept shorter if possible. The messages are by default surrounded by a blanked out area with no frame.

The positions for the messages are in the units defined by the `x` and `y` axis, not in inches as in some cases with `DISSPLA`.

7.3.11 Plot

The plot option can generate a plot on any of the graphic devices available within the IPNS environment without leaving the `EASYPLOT` program. Use Tektronix graphics mode for the HDS terminals. One can also generate a metafile (`PLT2.DAT`) for a hardcopy plot by the `POSTPLOT` program.

If there are error messages produced by `DISSPLA` during the plotting of the data they will be displayed in the lower half of the screen. To observe these messages it will probably be necessary to use the `SCROLL/NO_SCROLL` key on the keyboard (usually lower left button).

7.3.12 Quit

Quit will allow the user to exit the EASYPLOT program in one of two ways:

- 1) Save the plot setup in a binary file for later recall (option 8) and modification by the user. The file name is supplied by the user unless a saved file had previously been restored. At this time the previous SAVED file name is listed and can be re-used or edited. The saved file will be of type ".SAV".
- 2) Exit the program without saving.

If a plot is saved, information is appended to a file named EASYPLOT.SAVES in the users main directory. This ASCII file can be used as a simple data base of saved files. Useful over the years to find where a particular plot may have existed. Upon exiting the program the standard DISSPLA terminating messages will be observed if one has done any plotting.

7.3.13 Vectors

Most of the VECTOR area is self explanatory. Only the four number code for the arrowheads needs some review. This is the same as in the DISSPLA manual.

```
CALL VECTOR(XFROM,YFROM,XTO,YTO,IVEC)
```

where IVEC is a four-digit number 'wxyz' describing the arrowhead.

W	ratio of width to length, 0 to 5	
x	size, 0 to 6	
y	form of arrowhead(s)	=0, solid; =1, white; =2, open; =3, closed
z	location of arrowhead(s)	=0, none, =1, at (XTO,YTO), =2, at

		both ends, =3, both ends pointing to (XTO, YTO)
--	--	---

7.4 Plotting on a Personal Computer

To plot data on a personal computer, we recommend using a program such as “Kaleidagraph”. Kaleidagraph is a popular Macintosh program that has recently become available for Windows personal computers. Use FTP to copy your data to your personal computer, then use Kaleidagraph to plot it.

8. IBM PC-Compatible Computers

8.1 Terminal Emulation

An IBM compatible personal computer (PC) can be connected to a VMS or UNIX computer either through a serial line to a terminal server or through an Ethernet connection using Telnet.

When using a terminal server or modem, terminal emulation software such as Kermit, KEAterm, CTerm, or Crosstalk must be used. Kermit is a good, free DOS-based terminal emulator that includes Tektronix graphics support. KEAterm is the best PC terminal emulator, but it is rather expensive. Crosstalk is a good Windows program for VT320 terminal emulation, but it has no graphics support.

8.2 Local Ethernet Connection

Direct Ethernet connection is the preferred connection for local PC’s. To use an Ethernet connection you must have TCP/IP networking software installed on your personal computer. If your PC is connected to the Ethernet, we recommend you obtain a copy of Hummingbird Exceed. Exceed provides both terminal emulation through a Telnet application and X Windows support for both terminal emulation and graphic displays. Although Telnet provides terminal emulation, a DECterm X-Window session provides better emulation. You can use the following method to create X-Window sessions with Exceed.

8.2.1 Method 1—Create an icon to start an X-term

- Start the Xstart application from the eXceed folder
- (use the default REXEC start method)
- Fill in the User ID and Host Internet node name
- Set the command to “@pns_lib:decterm computer-name”
- (where “computer-name” is the node name of your computer)
- Save the file
- Select “Install...” to create an icon for this connection
- Enter the name of your Exceed folder.

With this method, you can drag the icon to the Start Menu and then start future sessions from the Start menu.

8.2.2 Method 2—Start an X-term from a Telnet session

- Start Exceed (it will be minimized)
- Start Telnet
- Connect to the desired node from the Telnet session
- Enter your username and password when prompted
- Execute “@pns_lib:decterm.com”
- Log out of the Telnet session and terminate Telnet
- To create more windows execute the decterm procedure

With method 2, you might want to define a symbol to execute the command file. To modify the procedure for creating decterm sessions, copy “decterm.com” to your home directory first.

8.3 Accessing Files on Other Nodes

8.3.1 Using Windows 95 or NT

The most obvious way to access other nodes and the files on those nodes from Windows 95 or Windows NT is to double-click on the network neighborhood icon and then to select the node where the files of interest are located.

Another way to do this is through the Explorer application. From Explorer select the Tools ->Map Network Drive menu item and enter the path to the resource you want to access. Before you can access resources on other computers, they must be set shared.

Another way to access shared resources on other Windows computers is to select "Run" from the "Start" menu and then use the universal naming convention to specify the resource you want to access. For example, you could enter:

```
"\\nt-server\shared\hoffmann\"
```

and the system would open the specified folder on your desktop. This method allow your to go directly to the folder of interest without "drilling down" to the desired location using "browse".

8.4 File Transfer

There is a PC in the IPNS Control Room in Building 360 for transferring files and/or printing files created elsewhere.² 1 The PC in the Control room has both a 5.25" 1.2 MB diskette drive and a 3.5" 1.44 MB diskette drive. This PC has DEC's PCSA software for connection to the VAX computers. This allows file transfer to and from the VAX computers and the use of VAX print queues. It also provides for terminal emulation through use of the "SETHOST" command. To copy files using this PC, go to the DOS

² You can access the control room with a card key or by keying in a combination at the doors by the accelerator operations office. See one of the secretaries for the combination or a card key.

prompt and use the same syntax as used on the VAX except that you must precede the copy command with "NFT ". You also will need to provide a user name and password in most cases since there is no proxy login set up for the PC's. Thus to copy a file from the floppy disk (A Drive) of the PC to your default directory on ANLPNS you would use the command:

```
>NFT COPY A:filename ANLPNS"username password"::
```

If you wanted to transfer to a different disk device and directory you would need to include that at the end of the copy command (i.e. "disk:[directory]").

To copy a file from your default directory on ANLPNS to the hard disk (C drive) of the PC, you would use the command:

```
>NFT COPY ANLPNS"username password"::filename C:*.*
```

Note that DOS only supports file names of up to eight characters plus a three character file type. For file sharing between the PC and the Macintosh, see the chapter on Macintosh computers.

8.5 Software Licensing

All personal computer software should be properly licensed for the computer on which it is run. Unauthorized duplication and use of computer software is contrary to Laboratory and DOE policy and violates U.S. Copyright Law. Unless otherwise specified in a license agreement, the funds used to purchase a software product represent a license fee for the use of one copy of the software product.

If Tom Worlton is not available, Rick Goyette (360-C129; 2-4328) can set up user accounts.

The commands for binding and mounting the CDROMS and defining the necessary logicals are contained in the file "SYSS\$MANAGER:ESS\$MOUNT.COM"

ⁱCombination times which include the plus sign (+) must be enclosed in quotation marks. VMS also understands the time designations yesterday and today.

ⁱOnly commands issued by the user are shown, not the response by the computer and JBL 125.

ⁱThis is not intended as an exhaustive list. Before giving away any software you have not written yourself, contact the appropriate computer manager--Tom Worlton for VAX or AXP software, Rick Goyette for Macintosh software, or Merle Faber for PC software.

ⁱUsernames have been defined for most terminal server ports which allows the system managers to know the terminal location.

ⁱDo not attempt to use [^]F for command line editing if it is used as the forward switch on your terminal server.

ⁱⁱ.e. alignment of the numbers in particular columns is not necessary.

ⁱIn this example the TOF start is 5. The TOF values are usually in micro-seconds but for this example the times are in milli-seconds.