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Remote Operation of DOE-1 on
The Lawrence Berkeley Laboratory
CDC 7600, 6600 and 6400 Computers

March, 1978

Lawrence Berkeley Laboratory University of California/Berkeley

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REMOTE OPERATION OF DOE-1*
ON THE LAWRENCE BERKELEY LABORATORY
CDC 7600, 6600, AND 6400 COMPUTERS

DOE-1 Group
Lawrence Berkeley Laboratory
Berkeley, California 94720

* Formerly Cal-ERDA

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I. INTRODUCTION

This writeup describes how to run the DOE-1 building energy analysis program on the Lawrence Berkeley Laboratory CDC computers. Section II (excerpted from "WRITEUPS"* subset "INTRO"*) gives an overview of the LBL operating system and shows how to run a job on the 7600. Section III describes the DOE-1 program, presents a control card sequence for running the program, and shows the user how to store input, output, and intermediate files. Section IV gives a detailed description of the DOE-1 Weather Package.

* WRITEUPS is the library name for a major block of documentation on the LBL CDC computer system. INTRO is the name of one of the chapters (subset) of that library. The other major block of documentation is a library called HANDBOOK.

II. THE LBL COMPUTER SYSTEM

SYSTEM HARDWARE

The Lawrence Berkeley Laboratory Computing Facility is equipped with a CDC 7600, a CDC 6600, and a CDC 6400. The 7600 has 65,536 (60 bit) words of small core memory and 512,000 words of large core memory. The 6600 has 131,072 (60 bit) words of memory. The 7600 is served by one or more 6000 I/O stations, normally the 6400, which has 131,072 (60 bit) words. The 6600 can also serve as a 7600 station along with its normal load. The 7600 is considered to be the primary batch machine. The 6600 is considered to be the primary interactive machine. The 6400 normally provides job input and unit record output processing for the 7600 and 6600.

Temporary file storage for the 7600 is provided by two CDC 7638 disks, with an access time of 25-110 msec, and a total capacity of 160,000,000 words. Temporary files for the 6600 are stored on CDC 841 and 844 multiple spindle disks, which will hold 25 and 96 million words respectively. Up to about 3 million words may be used by an executing 6600 job (excluding certain files such as OUTPUT, PUNCH, PUNCHB, and PLOT). Up to about 25 million words may be used on the 7600 by any one computer job.

Permanent files are stored on magnetic tape and on two random access mass storage devices - the IBM 2321 data cells (385,000,000 words) and the IBM 1360 photo-digital storage system or chipstore (5,264,693,600 words on-line). In addition, the CDC 7638 disks contain a limited amount of high use permanent file space. The installation is equipped with eight CDC 659 magnetic tape drives (nine-channel) and twenty CDC 607 magnetic tape drives (seven-channel), up to eight 607s and three 659s may be used by a single 6600 job. All files referenced by a 7600 job must reside on a 7638 disk. That is, files used for input must be transferred to a 7638 disk before using them and files used for output must be transferred from the disk after the files have been created. These activities have been given the name STAGING.

In addition to magnetic tape and permanent files, data is input to the computers on punched cards (using four CDC 405 card readers), via remote terminals (primarily teletypes, used for interactive computing as well as remote job entry), or remote batch stations.

Output from the system can be obtained in printed form (using two CDC 512 line printers and five IBM 1403 line printers), on microfilm, on Calcomp plotters, on magnetic tapes, on punched cards (using two CDC 415 card punches), on paper tape (using a CDC/NCR 3691 paper tape read/punch), typed on a remote terminal, or may be directed to a remote batch station.

To provide convenient data storage and handling, especially for jobs with large volumes of output, computer output on microfilm (COM) is available. The COM system at the LBL Computing Facility is a Stromberg Datagraphix Model 4460 which produces microfiche (easy-to-handle microfilm cards) at 48X or 24X reductions, as well as microfilm output in 35mm and 16mm strip form. With 48X reduction up to 270 pages of line printer output can fit on a single 4 x 6 inch microfiche. Graphic and alphanumeric output are both available.

Four Calcomp model 565 incremental plotters (10 inch drum) are also available for producing graphic output. In addition, alphanumeric and graphic output may be obtained on five CRT display consoles (CDC 252 vista).

The pieces of system hardware to which the user has direct access are the remote terminals, display consoles, and the card readers and printers in the ready room (Rm. 1232, Bldg. 50B). CRT (vista) consoles are located in Rm. 2259, Bldg. 50B, and teletypes are placed at various locations throughout the laboratory. Although many of the LBL terminals in heavy-use locations are directly connected (hard-wired) to the computer system, the computing facility is also equipped with telephone lines for communication with remote terminals, with this dial-up capability, a remote terminal can be connected to the system simply by telephoning a dial-up connection. (Model 33 and 35 teletypes require an acoustically coupled data-set, Western Electric 103A compatible.)

In addition to interfacing with remote terminals for interactive computing and remote job entry, the Berkeley installation is also equipped with a remote batch interface system (University Computing Company COPE controller and a BKY designed and implemented COKE system). Users who have remote batch stations at their own facilities may submit batch jobs and receive printed output directly without traveling or sending couriers to the Berkeley computing facility. At the computing facility, dial-up modems connected to ordinary telephone lines are available for use by remote stations. Leased lines may be used by large-volume remote users, at their expense.

Along with the systems components described here, a variety of off-line peripheral equipment is provided for all users of the computing facility. The ready room annex (rm. 1232A, bldg. 50B) is equipped with seven IBM 026 card punches and two modified IBM 029 card punches. Data handling and tabulating equipment is located on the first floor between buildings 50A and 50B. This equipment includes an IBM 1401 system for off-line data transfers (tape to cards, tape to tape, tape to line printer, and many other operations), as well as two IBM 519 reproducing punches, two IBM 557 alphabetic interpreters, an IBM 083 sorter and a 1740 paper burster.

Punched cards read in at the Lawrence Berkeley Laboratory Computing Facility must conform to the FORTRAN H standard format (as produced by IBM 026 card punches). All key punches at the computing facility (including LBL's IBM Model 029 punches) use the FORTRAN H code plate. Methods of converting IBM and CDC 029 card decks to the FORTRAN H format are discussed in the UTILITY chapter of the BKY Users Handbook. For further information on punch cards and Berkeley definitions of such punches, see either the CONTROL or BCDIO chapter of HANDBOOK.

To obtain a copy of a subset (chapter) from HANDBOOK or WRITE-UPS, see Documentation under USER SERVICES, below.

SYSTEM SOFTWARE

The operating systems at the Lawrence Berkeley Laboratory Computing Facility have evolved from original CDC systems. The BKY 7600 system has grown out of the CDC Scope-1 system, and the 6000 system has its roots in the original Chippewa operating system. Both have been tailored to fit the particular needs of the Berkeley installation, and are maintained by a staff of system programmers at the laboratory.

The operating systems are given names which consist of the letters BKY -- an international code name designating the LBL Computing Facility -- and the number of the latest system version. A recent version of the 6000 system, for example, was BKY65B.

Job Processing Under the BKY Operating Systems

The BKY systems are file manipulating systems. The user creates files, reads, writes, and copies files. He/she loads, executes, repositions, and releases files. Files are always referred to by name, not by device or function. The file name is supplied by the user in all but a few standard cases (INPUT, OUTPUT, PUNCH, etc.).

On the 7600, all files are on disk, with the 6000s, all files are disk files unless otherwise specified by the user (e.g., by requesting a tape). The file INPUT is created from the job deck submitted by the user. Its first section -- the control cards -- specifies the sequence of operations to be performed as the job is processed. The other sections (e.g., a FORTRAN program deck and data deck) may be considered data to be processed by the programs specified in the control record.

CONTROL CARDS, for the most part, are program calls. Rather than specifying a function for the operating system to perform directly, a control card causes the loading and execution of a program which resides on the file whose name is specified on the control card. The arguments, if any, are parameters required by that particular program. Thus the control cards COPY and REWIND, for example, are actually the

names of system programs which control the copying and rewinding of files.

Compilation of a program produces object code on a file which, unless otherwise specified by the user, is named LGO. The object program may then be loaded and executed by the LGO control card. In fact any disk file, whether created by the system or by the user, may be executed by specifying the file name on a control card. Files on other media must be copied to disk before direct execution is possible.

The file OUTPUT (a disk file) contains the standard print output for a job. FORTRAN PRINT statements refer to OUTPUT -- that is, the current values of the arguments of a PRINT statement are placed on the file OUTPUT (unless directed elsewhere by the program header card or an argument on the control card). At job termination, an abbreviated history of the job, called the DAYFILE, is placed at the beginning of OUTPUT, and everything on the file OUTPUT is printed.

The Various 6000 Supporting Subsystems

The supervision of the various subsystems of the computing facility -- the input, output, and mass storage devices, for example -- is one of the tasks of the 6000 system. Some of these major features are described below.

Automatic Tape Fetching System

An automatic tape fetching scheme has been implemented at the Lawrence Berkeley Laboratory Computing Facility. It allows the operations staff to keep track of, and provide fast service for, about 40,000 active library tapes.

Library use analysis shows that fewer than 7 percent of the 40,000 active tapes are used during any two week period, and chances are three in four that if a tape is requested, it has been used during the preceding two weeks. Using this information, the system has been designed to greatly reduce both the amount of tape handling by operators and the wait time for fetching tapes from the library.

A high capacity (more than 1,000 reels) tape rack is located in the console area, and its slots are labeled in a three character alphanumeric code. A system program assigns slots to active library tapes, and monitors their use. When a library tape is requested, the program checks to determine if the tape is already on file in the console rack, and if it is, tells the operator the slot number via a display. If the tape is in the vault, a label will be printed on a teletype giving the library number and the console slot to which it is assigned. The label is then affixed to the tape and the tape is sent to its console slot where it will remain until it becomes the least active tape in the rack (probably several weeks). To use this system the library tape number must be placed on the STAGE or REQUEST card in the specified format (see the BKY Users Handbook subset SAMPLES).

PROGRAM STORAGE SYSTEM (PSS)

The Program Storage System is a permanent file system designed to accomodate moderate sized files which are changed or used relatively frequently (e.g. user programs). Information in the PSS system resides on seven IBM 2321 data cells.

Each data cell consists of 2000 strips. A strip is divided into allocatable units of 20 tracks (1/5 strip) and each allocation unit can contain up to 5500 words of data. There is no limitation on file size for information stored on the data cell (except the practical limitation of available space).

A permanent file within the PSS system is called a subset and subsets are grouped into libraries. You can generate your own storage library, read or copy subsets from your library, or alter the contents of your storage library. You can also copy files from the various data cell libraries available for general use. For example, the Computing Facility program libraries for the 6000s and 7600 are stored on the data cell. In addition, many program writeups and other current documentation for the system are stored in the data cell libraries HANDBOOK and WRITEUPS. Use of the PSS software is described in the

handbook subset STORAGE and in the writeup PSS, and examples are shown in the handbook subset SAMPLES.

MASS STORAGE SYSTEM (MSS)

The IBM 1360 photo-digital storage system (CHIPSTORE) was developed under special contract by IBM for the Lawrence Berkeley and Livermore Laboratories. It is designed for the storage of large amounts of permanent and semi-permanent data, especially for applications where the large volume of data poses problems for standard data storage techniques, or where data reliability is very important.

The CHIPSTORE consists of equipment for reading, writing, and storage of film chips containing digital data. Each chip can contain up to 74,784 words of useful information. For data storage, 32 film chips are placed in a plastic box and stored in the file module (storage unit), which can hold up to 2200 such boxes. The CHIPSTORE has an on-line capacity of 5,264,693,600 words, equivalent to almost 3000 full reels of seven-track magnetic tape. In addition, boxes can be taken off-line for archival storage.

Information is written on the film chips by a two-step recording and developing process. An electron beam recorder generates lines of light and dark spots across the film chip, which is then developed automatically. The chips are read by a CRT flying spot scanner. It takes about 3 minutes to write and develop a film chip and up to eight chips may be developed at once. The access time for reading existing chips is much faster, about 3-5 seconds; the maximum average read transfer rate is about 20,000 words per second.

The CHIPSTORE operates under the Mass Storage System software package (MSS). Its use is described in the writeup called MSS.

Remote Batch System

A remote batch job entry system is connected to the 6000s. From a remote batch station you may submit a punched card deck to be run on the central computer as a batch job. After completion of the job on the central computer the printed output is returned to the originating

remote batch station for printing. Some stations may also have the ability to send and receive files to be processed on other peripherals (e.g. plotter, card punch, magnetic tape).

The remote batch job entry system consists of control computers and related hardware and software which perform the task of interfacing remote sites to the central computing facility. The remote sites are connected to LBL over leased or dial-up lines.

If a leased line is employed, the user must support the cost of the interface and modem at the LBL end as well as the leased line, modem, and remote batch station at his/her end.

The types of remote batch station that may be connected to the dial-up ports include the CDC 200UT and the Univac 1004, or any station that emulates either of them. However, the 1004-type remote batch station is incapable of receiving messages (job status, etc.) from the central installation. For this, and other reasons, we discourage 1004-type stations.

The leased line facility supports COPE full duplex stations as well as 200UT and 1004 type terminals.

Currently the remote batch system has 63 ports operating. 24 are COKE 200UT dedicated lines while 15 are dedicated COPE lines. In addition, there are a total of 24 dial-up lines available for 200UT users. 10 of these are 4800 BPS lines, 7 are 2000 BPS lines, 6 are 2000 BPS lines connected to the federal telecommunications system (FTS) network, and 1 is a 4800 BPS FTS line.

Remote Terminal Interface

The RECC (Remote Equipment Control Computer) system is a collection of hardware and software which provides teletype service to BKY users. It gives access to two time sharing systems, permits users to write their own interactive 6600 programs, and returns information about the status of jobs running in the 6000s and the 7600. The two principal subsystems operating under RECC are SESAME, and the PEOPLES TIME SHARING SYSTEM (PTSS).

The RECC system hardware consists of a large (28,000 12 bit words)

PDP-8E computer which is connected to the 6000 system through two channel synchronizers. Teletypes are connected to the PDP-8 through a set of multiplexers. The multiplexers generate an interrupt to the PDP-8 whenever a key on the terminal is pressed. The system provides for the simultaneous handling of up to 224 teletypes in full duplex mode. Although the teletype is the primary device used on the RECC system, the system is sufficiently flexible to handle other, faster devices, such as CRT terminals.

The RECC system software consists of the PDP-8 teletype driver, and the 6000 polling routines which switch messages between the 6000 computer and the PDP-8. The PDP-8 teletype driver resides permanently in the PDP-8 system, and is responsible for the handling of individual teletype characters through the multiplexers. Each of the teletypes connected to the system has two input and two output buffers in the PDP-8 memory. Information is transferred between the PDP-8 buffer and the 6000, one line at a time. Use of the RECC system, and interactive teletype jobs in general, are described in the handbook subset TTY.

Remote keyboard terminal users may want to look into public network data transmission lines such as Telenet, Timenet, Tycom-III etc., for more advantageous rates than long distance telephone.

The 7600 Operating System

The 7600 operating system is based on CDC's 7600 SCOPE 1.1.6 system. Local modifications are continually being made by the BKY systems staff and resident CDC analysts.

The BKY 7600 system does not communicate directly with any input or output device except its own high-speed disks. All input data, whether from tape, data cell, cards, or whatever, must be transferred to the disk before it can be utilized by the 7600. Similarly, all 7600 output goes first to the disk and must be delivered to its final destination by the supporting computer. This sending and receiving of data to and from the 7600 disk is called STAGING, and the computer that carries it out is known as a STATION.

The 6000 I/O Stations

The 6000-series computers (6400 and 6600) are the I/O stations for the 7600. They run under the BKY 6000 system. It is through them that 7600 jobs can access the various BKY subsystems (data cell, chipstore, microfilm, etc.).

7600 Documentation

The 7600 system, as implemented at LBL, is discussed in locally written documentation. The BKY Users Handbook is the user reference manual, and the writeup BKYNEWS lists current system changes and known bugs. Other WRITEUPS give examples of control card sequences for using various of the BKY subsystems.

USER SERVICES

Sources of Information

The Lawrence Berkeley Laboratory Computing Facility provides a number of services (programming consultants, a program library, a computing library, courses and seminars) designed to make it convenient for you to use the computer system. These services are described below.

If you have any questions about the facilities or any general problems while working at the Computing Facility, please see/call Eric Beals (Rm. 2232C, Bldg. 50B, Ext. 5351).

Documentation

Experience has demonstrated the futility of trying to maintain up-to-date versions of printed manuals documenting a computer facility that is extensive, varied, and subject to continual modification. At LBL, the quest for a more flexible mode of documentation has led to the implementation of a Dynamic Documents Library which is stored on the data cell. It has proven particularly satisfactory for several reasons. In the first place, additions and changes to the library can be made without the delay and expense of publishing. The procedure

for modifying the library has been largely automated -- the setting up of page formats, tables of contents, and indexes, for example, is done for the most part by the computer. In addition, the writeups are very accessible. Even at a remote site the user can have the latest version of a desired document printed out at any time.

The following table shows documents stored on the data cell which contain fundamental information about using the LBL 6000 and 7600 systems.

	Sample Control Card Sequences	Basic Reference Manuals	Bugs and Changes
7600	Subset Samples In Handbook	BKY Users Handbook	BKYNEWS
6000	BASIC 66	HANDBOOK/ BASIC 66	

The principal reference document for the BKY systems is the BKY Users Handbook. The handbook occupies a data cell library, and each of its chapters is a subset of the library. ('Libraries' and 'subsets' are standard data cell storage units.) The subset called CHANGES contains information on the contents of the handbook and also shows how to get copies of the rest of the chapters.

The other primary source of locally written documentation is the data cell library WRITEUPS. The contents of the WRITEUPS library are also listed in CHANGES

The example below shows how to get a copy of the handbook. To get a copy of WRITEUPS, substitute WRITEUPS for HANDBOOK.

```
JOB.ACCOUNT,YOUR NAME
*6,PSS,NOTAPES
LIBCOPY,HANDBOOK,OUTPUT.
<END-OF-JOB-CARD>
```

If the job is to be printed at BKY, and 8 x 11 paper is desired, add

the following card before the LIBCOPY card -

DISPOSE,OUTPUT=PR,PA=1F.

In addition, CHANGES indicates the date of the most recent version of each handbook chapter and writeup and printed manual. There is also a separate page listing the most recently changed documents. This makes it easy for users to know which of the documents in their collections are out of date.

To keep track of the local documentation, then, one should always have the most recent version of CHANGES. It is updated whenever documentation changes. To obtain a copy, run the following job:

WRITE,7,10,30000.123456, YOUR NAME

*6,NOTAPES,PSS

LIBCOPY,HANDBOOK,OUTPUT,CHANGES.

<END-OF-JOB CARD>

NOTE: You need to supply your own account number (replacing 123456), and your name.

All of the documents in the chart above, except for the BKY Users Handbook, are from the library WRITEUPS. Some other writeups of general interest are:

MSS All about the photo-digital mass storage system (CHIPSTORE).

SESAME Using the computer interactively.

PSS All about the program storage system (data cells).

UPDATE Describes the UPDATE program which is used to maintain and change source decks.

There are many others; all are listed in CHANGES. Documents on the WRITEUPS library may be obtained by submitting a job like the following:

GETME,7,10,30000.123456, YOUR NAME

*6,NOTAPES,PSS

LIBCOPY,WRITEUPS,OUTPUT,BASIC66.

<END-OF-JOB CARD>

This will obtain a copy of the writeup BASIC66, which shows sample deck setups for the most common types of 6000 operations. Other writeups are obtained by substituting the appropriate name for 'BASIC66'. More than one writeup may be listed, separated by commas.

Courses and Seminars

A number of short courses and seminars are presented from time to time at the computing facility. These courses are taught by the LBL computer center staff. They are non-credit courses, open to all users at no charge. Announcements of scheduled courses and seminars are published in the Computer Center Newsletter.

In addition, informal classes aimed at introducing the new user to the LBL 6000/7600 system are held periodically. Classes might include orientation for new users of BKY, how to use control cards, how to interpret a dayfile and/or dump, using various storage media, effective use of subsystems (such as NETED or UPDATE), or whatever you want to know. To arrange a class, contact either the consultants (843-2740, x5981) or Maggie Morley (843-2740, x5529). Courses to order, at your site and at your cost, are also available.

Consulting Service

The Mathematics and Computing Department maintains a consulting service open to all users of the Computing Facility. All consultants are experienced programmers. They will answer programming and debugging questions and provide assistance in using the computers.

If you have any difficulties in preparing, submitting, or running a job at the Computing Facility, see the consultant on duty. The consultant will either help you solve your problem or refer you to someone who can.

The Consulting Office is located in Room 1237A of Building 50B. The extension is 5981. There is also an outside line direct to the Consulting Office -- 415/843-1009. On the FTS network use 451-5981. Please do not use this number except on FTS.

Consulting hours

Mon. - Fri. 9 A.M. to 9 P.M.

Sat. and Sun. 11 A.M. to 5 P.M.

Closed Wed. 12:15 P.M. to 2:30 P.M.

Expeditor Service

The expeditor service offers the remote user personalized attention to problems which require, or may be better served by, on-site attention. These services are performed by members of the computer operations group who have access to all computer input and output facilities, as well as to the tab equipment (duplicator, sorter, interpreter), the 1401 (tape manipulation and duplication), the tape cleaner and certifier, the BKY documentation, and shipping and receiving facilities. The above list is not exhaustive - services are tailored to the requests of the user.

The expeditor service is most useful for products which can be produced at BKY, but possibly not at your facility, e.g., punched card decks, 8 x 11 copies of documentation, etc.

The following things are needed if the expeditor service is to be used:

1. An active LBL account number for computer use which authorizes labor charges (usually with the phrase "and related services").
2. A letter to the expeditors from the user site operations manager, group leader, or similar authority, giving authorization for services, and who will be responsible for notifying expeditor services of labor charge account number changes.
3. A list of the people (operators, programmers) who are authorized to request services, or whose name might appear on any of the materials (job output, tapes, etc.) to be serviced.
4. The name of the project leader in charge.
5. All initial requests must be sent to Dan Mangonon, Bldg. 50B, Rm. 2249A.

Types of Service, and Charges

Service is normally requested by contacting the expeditors (Bldg. 50B, Room 2249A, 415/843-2740, ext. 6205) and describing what is needed. A "request" is usually considered to be whatever tasks are specified in one contact with the expeditors. The charge for the service depends on the amount of time needed to satisfy the request, the time

at which the service is to be performed, and the type of service requested. The service time for each request is rounded to the nearest 30 minutes. There are minimum time periods for each type of service.

In addition, some requests may involve mileage charges or supplies, which are charged at cost, plus laboratory overhead (40.5 percent).

Regular Service

The regular expeditor hours are (currently) 9 A.M. to 5 P.M., Monday through Friday (excluding LBL holidays). Requests which are received and serviced during these hours are charged approximately \$7.00 per hour, with a minimum of 30 minutes per request. Regular service requests are normally processed in the order received.

Rush Service

Rush service is available for those circumstances when the user needs an expeditor to devote full time and energies to the fulfillment of a specific request. The expeditor works closely with the user, informing him/her of any errors or difficulties in processing and of job completion. The expeditor is responsible for all job output. Rush service requires approval from the user's Site Operations Manager, or designee. If rush service is required outside of regular expeditor hours, it should be requested sufficiently in advance - normally, one working day.

The rush service user is charged for twice the time it takes the expeditor to satisfy the request. The charge per hour and minimum charge are the same as for regular or extended service, as applicable.

Extended Service

Expeditor services are also available outside regular working hours, if the request is made sufficiently far in advance - normally, one working day. The charge is approximately \$7.00 per hour, and

1. On normal workdays the minimum is 2 hours,
2. On weekends the minimum time is 4 hours,

3. On LBL holidays the minimum time is 4 hours and the cost, in this case, is approximately \$10.50 per hour (time and a half).

On-Call Service

On-call service is offered for those circumstances where the user wishes to have an expeditor available, on-call, outside regular expeditor hours. This should be requested sufficiently far in advance - normally, one working day.

The user is charged for one half of the time the expeditor was on standby, and for all the time the expeditor was in transit and working. The charge per hour and minimum charges are the same as for extended service, with the addition of the expeditor's mileage costs to and from work.

Minimum Charge for Overlapping Extended Service

On occasions where extended service requests from a number of users overlap, the minimum time requirement will be spread over all the users. That is, if the total hours necessary to satisfy all the requests is greater than the minimum, no user will be charged the minimum. If the total time is less than the minimum, the remainder will be divided evenly among the users served.

On occasions where on-call requests overlap, the standby and transit time will be divided evenly among the users served.

On occasions when a request is made and serviced outside normal expeditor hours because an expeditor happens to be at the Lab at the request of another user, the minimum (and standby and transit costs, if applicable) will be divided evenly among the users who are served during that time.

Expeditor Accounting Services

The DMPER program is an accounting program that is run for the outside users on a weekly and/or monthly basis. This program creates an accounting tape for each individual group, by computer account number. After the accounting tape has been created, the user must write

a small program to read the information from the tape.

If you are interested in obtaining a monthly or weekly accounting tape, the following is necessary: a letter should be sent stating the name of the company, the type of accounting program you prefer, whether it's to be a weekly or monthly tape, and your LBL computer account number. Send this information along with your current telephone number to Computer Expeditor Services, Attention Dortha M. Hines, Bldg. 50B, Rm. 2264.

Expeditor Tape Services

Please note that procedures for tape handling are as follows:

We require group name, tape name, programmers name, and a valid account number. We would appreciate a phone number where we may reach the requestor. This information is very important so that we may fulfill the request with speed and accuracy. The expeditors have devised a form to fill out when sending tapes. To get 15 copies of this form, run the following job:

```
<JOBCARD>
*B
LIBCOPY,EXPLIB,OUT,USER.
NCOPY,OUT,OUTPUT,15.
<END-OF-JOB CARD>
```

If tapes are to be released from the LBL Library the same information is required with the addition of the LBL Library Number (vital for prompt service). Please make sure that your tape has a tape seal and is properly packed to avoid any damage before arrival at our site. Also recheck that a letter containing the required information is included in your package.

Due to LBL policy we cannot send anything over the weight of three pounds through the mail unless we are supplied with government labels. For this reason, we are unable to send magnetic tape through U.S. Mail nor do we recommend this mode of transportation for magnetic tapes as we cannot guarantee their safe arrival or their condition.

Shipments

Shipments between LBL and user sites are made by commercial carrier, and should be arranged ahead of time with the expeditor service. Transportation to the carrier can be made by outside delivery services or by the expeditors.

It has been our experience that commercial pick-up and delivery services cannot give assurance of connections with the carrier. The expeditors, however, are able to provide the flexibility to meet airline or bus schedules as needed by the user, and to provide tracing in the event of shipment delay. Further, the user can receive telephone confirmation of the shipment's flight number or scheduled bus arrival. In most cases airfreight shipments can be in the user's hands by the next morning when handled by the expeditor service.

Incoming Shipments

All shipments to LBL should be sent prepaid. The address is

Lawrence Berkeley Lab
Attention Expeditor Service
Bldg. 50B, Room 2249A
Berkeley, Calif. 94720

Incoming Greyhound shipments should be sent prepaid to

Greyhound West Berkeley Station
(Address as above)

The expeditors regularly pick up shipments from Greyhound's West Berkeley Station.

Outgoing Shipments

All shipments are sent to the user on a C.O.D. basis. Pick-up by commercial delivery services should be arranged in conjunction with the expeditors.

Outgoing shipment deliveries by the expeditor service are made each weekday at 5 P.M., unless rush service is requested. All output to be shipped on a given day must be ready for packaging by 3 P.M.

Trips to the Greyhound Station are charged at the rate of 2.0 hours

per week, regardless of the number of trips made during that week, plus \$.15 per mile at 5.0 miles per trip. Mileage costs are divided evenly among the users of each delivery trip. No service charge is made if no courier service is required for the week.

Delivery to the airfreight terminal at San Francisco Airport is charged at the rate of 2.5 hours per trip plus \$.15 per mile at 30 miles per trip. These costs are divided equally among the users of each trip.

Miscellaneous Information

Magnetic Tapes

LBL-owned magnetic tapes are not allowed to leave the Lab. Users requiring magnetic tapes owned by LBL to be sent to their site must supply replacements, or purchase replacements from LBL in blocks of 10. Extras will be held at LBL for the user's use or for future replacements.

Routing Information

Two easy-to-use methods of specifying routing information for job print, punch, plot, and microfilm output are described in the BKY Users Handbook subset CONTROL. In general, the routing information needed is (1) specification that the output should be routed to expeditor services, and (2) the name of your company. Contact an expeditor for the exact routing information needed to route your job output to the expeditors. Users will be charged 30 minutes each day job output is found without routing information.

HOW TO BEGIN USING THE COMPUTING FACILITY

Preliminary Arrangements

Establishing a Valid Computer Account Number

All new users of the LBL Computing Facility who already have an account number should contact Eric Beals to verify that their account number has been established as a valid account number for using the Computing Facility.

Prospective users of the Computing Facility who do not already have an account number should contact

Eric Beals
Building 50B, Room 2232C
Lawrence Berkeley Laboratory
Berkeley, California 94720
Phone Number: 415-843-2740 Ext. 5351
FTS Number: 451-5351

for information on how to obtain a Lawrence Berkeley Laboratory account number.

Establishing a Remote Terminal

If you have a teletype (models 33, 35, or 37) or a teletype compatible terminal that you wish to connect to the LBL Computing Facility, contact Eric Beals (Rm. 2232C, Bldg. 50B, Ext. 5351). You can either use the dial-up connection, in which case you need a modem (Western Electric 103A Compatible) attached to your remote terminal, or you can obtain a leased line port (one-time charge of \$295), in which case you need (except for on-site users) two modems -- one at each end of the leased line.

The BKY Users Handbook subset TTY describes many of the features available to the remote terminal user.

Establishing a Remote Batch Station

Information on remote batch stations is contained in the writeup

OPTERM.

All questions of a technical nature concerning the initial installation of a remote batch terminal should be directed to

Don Zurlinden
Room 1145A, Building 50A
Phone 415-843-2740 Ext. 6329

Types of Job Input Available

You can submit a program to the computer in several ways -- the most convenient input method will depend on the nature of the job.

Standard batch processing jobs, particularly routines which will be run frequently with large quantities of data, are usually submitted on decks of punched cards. Part or all of a program (with the exception of certain control cards) may be submitted on magnetic tape or from a permanent storage device.

A general-purpose interactive system, SESAME, lets you enter, edit, debug, and run programs from a remote console. SESAME programs may use all the languages and equipment options available on the BKY operating system. If desired, you may submit a program to SESAME on punched cards and then edit, debug, or run it from your remote console.

In addition, if you have access to a remote batch station, you may submit your job through that station.

Types of Job Output Available

Most programs generate alphanumeric output which is printed on a line printer along with a standardized records of the job's progress through the system (called the DAYFILE). If you so specify, alphanumeric job output may also be displayed on a VISTA console, typed out at a remote terminal, written on a magnetic tape, or recorded on microfilm.

Graphic output can be generated on the VISTA display consoles, or in hard-copy form using the Calcomp plotters or microfilm. Requests for graphic output are made as part of your source program.

Graphic output on microfiche and microfilm (COM) is available

through four different data modes. These are described in the subset GRAPHIC of the BKY Users Handbook.

In addition, if you have access to a remote batch station, the output from your job can be directed to that station.

Obtaining File Space for Permanent Data Storage

At the LBL Computing Facility, files may be stored on magnetic tape (7 or 9-track) or on one of the random access mass storage subsystems -- the IBM 2321 Data Cell System (PSS) and the IBM 1360 Photo-Digital Storage System (MSS). 6000 Disk Storage is used for temporary files only, and is under the control of the system (the user may not create permanent 6000 disk files).

Magnetic Tape

All tapes used at LBL must be in the tape library. New library tapes may be assigned at job execution time through an automated tape library scheme: this feature is described in the writeups subset LIBTAPE. Existing data tapes may be put in the tape library by contacting the tape librarian (Jewel Walczak, Rm. 2249, Bldg. 50B).

When using a tape be sure to use the proper form of the STAGE or REQUEST control card (see the handbook subset STAGING or the writeup BASIC66).

PSS (Data Cell) and MSS (Chipstore)

Space on the two mass storage systems is assigned on a controlled basis for optimum allocation of the available file space. For information on obtaining file space on either the chipstore or the data cells see Bob Rendler (Rm. 2274A, Bldg. 50B, Ext. 5942).

NOTE: Sufficient file space is available for all users. Assignment of file space simply contributes to the efficient administration of the system.

7600 'Permanent Files' and 'Cache System'

Disk space is available for users to create 'permanent files'

using the 7600 permanent file subsystem. These files should, in reality, be considered transient -- more reliable permanent storage is available on the data cell, chipstore, and tape.

Files staged in from tape or from the data cell that will only be read -- not written on -- may be saved on disk in the 'cache system'. The cache system is similar to the permanent file system, but is simpler to use. Also, jobs using the cache system for small files (under 100,000 words) receive preferential treatment if the system is busy.

A single control card (FETCHMT for fetching magnetic tapes, or FETCHPS to fetch from PSS) will suffice to cause data to be staged to the 7600 and a copy of it saved in the cache, or, if the data is already in the cache, to simply copy it from there to the user's file.

For more information on the cache and the permanent file system, see the BKY Users Handbook subset STAGING.

RUNNING A BATCH JOB

Job Input Deck Set-Up

(NOTE: Extensive samples of control card sequences may be found in the handbook subset SAMPLES.)

A typical batch processing job input deck submitted to the LBL Computing Facility has the following format:

<u>Input Deck Cards</u>	<u>Description</u>
JOBNAME,5,100,50000.123456,JOE USER	Jobcard
(SPECIAL DIRECTIVES)	
(COMPILER CALL)	Control Card Record
(CALL TO LOAD AND EXECUTE)	
EXIT.	
(ERROR PROCESSING)	
7-8-9 CARD	Logical Record Terminator
PROGRAM MAIN (INPUT,OUTPUT)	
* * * *	FORTRAN Source
END	
7-8-9 CARD	Logical Record Terminator

* * * *

Data (if required)

END-OF-JOB CARD

End of Job Indicator

The first card in an input deck must be a JOB CARD and the last card must be an END-OF-JOB CARD. When the input deck is read in, the system copies the card images to a disk file which becomes the file INPUT at the time the job begins execution.

Each card image is a UNIT RECORD. The file is also divided into larger units called LOGICAL RECORDS. The typical FORTRAN deck shown above consists of three logical records. The control cards comprise the first, the FORTRAN source program the second, and the data for the FORTRAN program makes up the third.

Logical records are separated by 7-8-9CARDS -- cards with 7, 8, and 9 multi-punched in column 1.

For jobs read in through the card readers at BKY, the end of a job is indicated by a card with 6,7,8, and 9 punches in all four corners (pre-punched end-of-job cards are available by the card readers). Remote batch sites may have their own style of end-of-job card.

Jobcard

The JOB CARD must contain the JOBNAME, the ACCOUNT NUMBER and PROGRAMMERS NAME. It may also give other specifications for the job. (However, if you do not specify them, default values will be supplied by the system.)

Examples:

JOBNAME,7,40,50000.123456,PROGRAMMER NAME

JOBNAME.123456,PROGRAMMER NAME

The JOBNAME must begin in column 1 of the job card. The first character must be alphabetic and it may contain up to six additional alphanumeric characters.

Your ACCOUNT NUMBER always begins in the first column after the period. It must be a valid six digit Lawrence Berkeley Laboratory account number with no imbedded blanks.

Between the JOBNAME and the period, three parameters may be

specified -- JOB PRIORITY, COMPUTING UNIT (CU) LIMIT, and FIELD LENGTH. They are separated by commas, and, if specified must be in the order shown. Blanks on the job card are ignored, except in the account number.

The octal JOB PRIORITY determines the turnaround time for your job, and also affects the charge for running the job. The following priority categories are available.

Category	Value	Description
Instant	5 - 16	and CU limit 63 or less Best service available for short jobs. Charged as rush or normal, depending on priority used.
Rush	10 - 16	Best service available for the resource usage - costs 2.0 times as much as a normal job.
Normal	5 - 7	Normal service
Deferred	2 - 4	Executes only when there are no jobs with a higher priority - costs 0.5 times as much as a normal job.

The default value for JOB PRIORITY is 5. If the CU LIMIT is no more than 63 with priority 5 through 16, the job runs as an instant job.

The decimal COMPUTING UNIT LIMIT specifies the maximum number of computing units the job may use. CUS are accumulated during job execution. It was mentioned previously that control cards are, for the most part, program calls. The rest of the cards in the deck may be considered input data for programs called into execution by the control cards. All 80 columns of a control card are read. (Continuation is facilitated by punching a + in column 1 of the next card. There is no practical limit to the number of continuation cards.)

Just prior to the control cards proper come the SPECIAL DIRECTIVES. They are used to indicate routing to a specific machine (*B),

use of a particular device (*PSS *MSS *MSSW), use of the user printer (*USERPR), or that the job does not do any staging (*NOSTAGE). There is a *LOCAL card which can be used by remote stations to cause all print, punch, plot, and film files to be processed at LBL and a *SC= card which can direct such files to any site. There is also a special password card for accounts using passwords.

Each control card contains a file or program name of seven characters (or less) in length, and may have up to 51 arguments separated by commas. The control card normally terminates with a period. No argument may be longer than ten characters in length and most are restricted to seven characters.

Once the card has been decoded, a scan is made for a user file with the same name as the first word on the control card. If one is found, it is assumed to contain a program and the file is loaded and executed. If no such file is found, a list of system programs is searched. If the program cannot be found, the control card is declared illegal and the job is terminated.

Each control card is allowed the field length specified on the jobcard. This default field length can be reset by the SFL control card and remains reset until another SFL is encountered.

The following 6600 example shows how to get a copy of the writeup BASIC66, which is the basic guide to using the 6600 at LBL.

```
B6600,7,40,20000.123456, JOE USER
```

```
*6
```

```
LIBCOPY,WRITEUPS,OUTPUT,BASIC66.
```

```
6-7-8-9 CARD
```

The *6 card is a special directive. It indicates that the job is to be run in the 6600.

The LIBCOPY card causes the system program LIBCOPY to be loaded and executed. It copies from the data cell library WRITEUPS to the file OUTPUT the subset called BASIC66.

Submitting a Batch Job

Locally

Prepare your job input deck as described above and take it to the Ready Room (Rm. 1232, Bldg. 50B). Three self-service card readers are provided there for submitting jobs. (Ask for assistance at the I/O counter if you are not familiar with the card reader operation.)

While your input deck is being read in, the CRT display located near the input card reader will respond with a modified jobname for your job. The system replaces the sixth and seventh characters of your jobname with a two-digit number to produce a unique seven-character modified jobname. The first time you submit any job, this two-digit number will usually be 00. If your job is resubmitted (or any job with the same jobname is submitted) while the original jobname is still known to the system, the newly input job will be assigned the next two-digit number in sequence so that it, too, will have a unique modified jobname.

Examples:

JOBNAME		MODIFIED JOBNAME	
JOBNAME	JOBNA00	JOBNA01	JOBNA02
MINE	MINE000	MINE001	MINE002
JOB2	JOB2000	JOB2001	JOB2002

If you wish to inquire about the status of your job while it is running, be sure to note the modified jobname when you submit your job.

After your job has been completely read in (the end-of-job card has been sensed) the CRT display located by the input card readers will respond with a message telling how many cards were read, and the modified jobname; for example:

132 CARDS READ - JOBNA01

Be sure to check this.

Remotely

Job submission from remote batch stations is discussed in the

writeup OPTERM.

How to Inquire About Job and System Status

You can use any interactive terminal (connected to the system) to inquire about the status of a batch job. Just type two greater-than characters (>>) followed by the modified jobname and press the RETURN key. For example: >>JOBNA00 or >>JOBNA02.

The system will respond by typing the status of your job, informing you whether it is in the input queue, is executing, is in the output queue, etc.

To obtain a report on the status of the 7600, type >7, then a carriage return, at a remote terminal.

Example:

>7

* XEQ-114 PSS-1 TAPE-1 MSS-2, QS IN-216

This report states that 114 jobs are executing in the 7600, one job is waiting for PSS staging, one job is waiting for tape staging, two jobs are waiting for MSS staging, and the input queue consists of 216 jobs. The * indicates that only jobs with *NOSTAGE cards are being admitted to the 7600.

Similarly, the status of the 6600 may be obtained by typing >B, and of the 6400 by >C.

INTERACTIVE JOBS

Submitting a Job From a Remote Terminal Using SESAME

SESAME is a system which enables you to communicate with a CDC 6000 computer from an interactive teletype terminal. The primary convenience of a SESAME is that it allows you to perform small-scale tasks directly at a terminal, rather than by creating a punched-card input deck.

Once you are logged in, you can directly execute control cards on the 6000, or submit new jobs to the 6000 or 7600. SESAME also

offers a line-at-a-time desk calculator and interpreter for on-line execution of simple programs using a restricted subset of FORTRAN.

In addition, SESAME has a convenient mechanism for storing programs on, and retrieving them from, the data cell. Once a program has been loaded into the SESAME editor from the data cell, it may be edited, executed, and/or stored back on the data cell (restoring is necessary only if it was modified while in the editor).

The writeup SESAME explains in detail how to use SESAME for all these functions. A basic introduction to control card execution and to remote job submittal is given below.

Logging in with SESAME

To log in from a model 33 or 35 teletype, or similar terminal, type >LOG, and then a jobcard, exactly as you would punch it on a card. This may be a full jobcard, or an abbreviated one. (Jobcard format is discussed in the chapter 'Running a Batch Job', above.) Then press the RETURN key. For example:

```
>LOG,OPEN.123456,ALI BABA
```

The system will respond with three lines:

```
LOGIN CP-24 TTY-009 14.34.23.**BKY65B*B*10/30/76.  
OPEN000 LOGGED IN.  SESAME 2.5  
OK - SESAME
```

You are now logged in, and the SESAME subsystem is awaiting your pleasure.

Note that information is sent from the teletype to the system one line at a time. The line that you type is not transmitted to the system until you press the return key.

When you are finished using SESAME, terminate by typing >KILL or, if no printed output is desired, >WIPE. The system will acknowledge the disconnect command by responding:

```
JOB ENDED - DISCONNECTED
```

SESAME Sequence Numbers

SESAME has a number of subsystems, the most powerful of which is

the SESAME editor. To enter the editor, type ↑EDIT (this gets you into the subsystem ↑EDIT).

Once you are in the ↑EDIT subsystem, you may begin entering lines into what is called the 'text buffer'. In a program entered via SESAME, each typed line of the program is equivalent to a punched card in a standard input deck. A sequence number, followed by one space, must precede each typed line.

Example:

```
1 MYJOB,7,40,30000.123456,TOM PROGRAMMER
2 FTN4.
3 LGO.
```

SESAME will place your statements in the order of their sequence numbers, no matter which statements you type first. Fractional sequence numbers are permitted -- they are especially useful for making insertions.

Example:

```
1 MYJOB,7,40,30000.123456,TOM PROGRAMMER
2 LGO.
1.25 FTN4.
```

Note that column 1 is normally the first character after a blank which follows the sequence number, even when the number of digits comprising the sequence number varies.

If you type two lines with the same sequence number, the new line automatically replaces the old one. Typing the following

```
1 MYJOB,7,40,30000.123456,WRONG NAME
1 MYJOB,7,40,30000.123456,RIGHT NAME
```

will leave in the text buffer only

```
1 MYJOB,7,40,30000.123456,RIGHT NAME
```

The sequence number is not the same as a FORTRAN statement number. Numbered FORTRAN statements used with the SESAME system must include both the sequence number and the desired FORTRAN statement number.

Example:

```
1.25 100      CONTINUE
```

Executing Control Cards Directly -- ↑Run

By logging in with SESAME, you are initiating a job within the 6000 computer. This job is no different in many ways from an ordinary batch job -- it has a name, which is the jobname you typed when you entered your jobcard; it accumulates computing units according to the amount of work you do, and governed by the limit you specified on the jobcard (The TTY connect-minutes are added to the job cost after the job finishes. Thus an interactive job may use more computing units than specified on the job card); it has a dayfile, or job history, which is sent to a printer when the job concludes, regardless of whether or not anything else is written to the output file (unless you terminate with ↑WIPE), and so forth.

It differs from the average batch job, however, in that the control cards which are to be executed during the job need not have been specified before the job begins -- you may type them in as you go along. This is possible because your teletype is connected to the job while it is executing, and because the SESAME system provides you with convenient mechanisms for talking back and forth with the job as it executes.

The SESAME command ↑RUN may be used to cause immediate execution (on the 6000s) of the control cards in the text buffer. You could obtain a copy of the BKY Users Handbook subset CHANGES and WRITEUPS subset SESAME, for example, by logging in as shown above, and then typing:

```
↑ EDIT
1 LIBCOPY,HANDBOOK,OUTPUT,CHANGES.
2 LIBCOPY,WRITEUPS,OUTPUT,SESAME.
↑ RUN
```

When the LIBCOPY is complete, you will get the message

```
OK - ↑EDIT
```

You can now use SESAME again, or you can use >KILL to have the output (along with the dayfile) come off the printer just as though it had been produced by a 6000 batch job.

Notice that, in contrast with the ↑SUBMIT facility which is

described below, no jobcard and no special directives or routing cards (control cards beginning with an asterisk or open parenthesis) should be present in the text buffer when using ↑RUN. They are cards that have meaning only at the time a job is first being created, and all initialization for this job was completed at the time you logged in.

If you wish to specify new jobcard parameters, or execute a program on the 7600, or employ special directives or routing cards, use ↑SUBMIT (see below).

Structure of the Job -- ↑Run and ↑Submit

With both ↑RUN and ↑SUBMIT (discussed below), the contents of the text buffer is copied to the file INPUT. Thus, the control cards may be followed by FORTRAN programs, data, etc., in the same way they would be if it were a deck being read in through a card reader.

Any line in the text buffer which consists only of the three characters (EOR) is interpreted as a logical record terminator (the equivalent of a 7/8/9 card). SESAME automatically appends an end-of-job indicator (the equivalent of a 6/7/8/9 card) when you do either ↑RUN or ↑SUBMIT.

Using ↑SUBMIT

The ↑SUBMIT command may be used to submit everything in the text buffer to the 6600 or 7600 as a totally separate job (independent of the job you created by logging in), just as if it were read in through the card reader.

When using ↑SUBMIT the first line in the text buffer must be a job card (see the chapter 'Running a Batch Job' for a description of the job card). SESAME submits all of the lines in the text buffer as a job, and appends an end-of-job indicator.

The following is an example of a FORTRAN job submitted remotely to the 7600 using ↑SUBMIT.

```
1 MYJOB,7,40,50000.123456,TOM PROGRAMMER
2 MNF4.
3 LGO.
```



```
4 EXIT.

5 DUMP,0.
6 EOR
7      PROGRAM BUG(INPUT,OUTPUT)
8 1    READ 100,A
9      IF (A.LE.0.) STOP
10     B=A**3
11     PRINT 101,A,B
12     GO TO 1
13 100  FORMAT(F10.5)
14 101  FORMAT(* A= *,F10.5,* B= *,F10.5)
15     END
16 EOR
17 1.357
18 17.32
19 -1.
↑SUBMIT
```

After you type ↑SUBMIT, the system will respond

<MODIFIED JOBNAME> QUEUED IN

OK - ↑EDIT

CHARGES FOR USING THE BKY COMPUTERS

An Explanation of Charges

Accounting Units

All charges for using the LBL computing facility are accumulated in ACCOUNTING UNITS (AUS).

The total cost per AU depends on whether you are a DOE-related user or not -

5.6 cents per AU for DOE-related users.

7.1 cents per AU for non-DOE user.

The above numbers already contain a 40.5 percent laboratory overhead.

All of the job related charges (CPU time, I/O activity, TTY

connect time, tape mounting, and memory) are measured in COMPUTING UNITS (CUS), which accumulate as the job executes according to the formulae described in the next sections. These computing units are recorded on the dayfile at the conclusion of the job for later processing by the accounting programs. The cost in accounting units for the job are calculated by accounting programs by multiplying the number of CUS by a factor for priority (P) and addition a job initialization charge (J).

$$\begin{aligned} \text{AUS} &= \text{J} + (\text{CUS} * \text{P}) && \text{ON WEEKDAYS} \\ &.5 * (\text{J} + (\text{CUS} * \text{P})) && \text{ON WEEKENDS AND HOLIDAYS} \end{aligned}$$

The PRIORITY FACTOR (P) depends on the job priority. In general, rush and normal jobs will be run before deferred jobs.

	P Factor	Jobcard Priority	Internal Priority
Deferred Jobs	0.5	2-4	P2
Normal Jobs	1.0	5-7,17	P3
Rush Jobs	2.0	10-16	P4

The JOB INITIALIZATION CHARGE (J) is 10 for running a job on the 7600 and 2 for running a job on the 6000s. This charge recovers the costs associated with submitting a job at LBL (system initialization and bookkeeping). Dividing a job in half and running it as two separate jobs requires a significant increase in system overhead.

Calculating 6000 Computing Units (CUS)

Charges for Interactive 6000 Teletype Jobs

All 6000 interactive teletype jobs accumulate TTY CUS while they are connected to a teletype. If the interactive job is not connected to a teletype no CUS are accumulated (a user may disconnect the teletype from the job and later reconnect, see the BKY Users Handbook subset TTY). The time spent waiting for a system resource (e.g., memory, tape drives, etc.) is not included in connect time.

The number of TTY CUS accumulated for each TTY connect-minute varies, depending on the time of day the job is being run. The following chart gives the various rates:

<u>Time of Day</u>	<u>Charge</u>
Midnight to 6 a.m.	1/4 CU per connect-minute
6 a.m. to 10 a.m.	1/2 CU per connect-minute
10 a.m. to 6 p.m.	1 CU per connect-minute
6 p.m. to midnight	1/2 CU per connect-minute

6000 Monitor Requests

Each time the user obtains some service from the 6000 system, the user is charged one or more monitor requests. Some services, such as calls to status, data, hour, and second, generate exactly one request per call. Others, I/O calls in particular, can generate more than one request.

The number of monitor requests generated by a single I/O call depends on the type of I/O (formatted or unformatted), the size of the buffer, and the device involved, as shown below.

Style	Direction	Device	Amount Transferred Per MR
Unformatted	In or out	Tape or disk	One record if it fits in the buffer. Otherwise, one buffer-full.
Formatted	In	Tape (BCD)	One line image
		Tape (B MODE)	One buffer-full
		Disk	One buffer-full
	Out	Tape or disk	One buffer-full
Buffered	Out	Tape or disk	One record
Buffered	In	Tape or disk	One record if it fits in the buffer. Otherwise, one buffer-full.

Handling and Materials Charges

Handling Charges

A handling charge of 10 CUS is made per REEL OF MAGNETIC TAPE

HUNG at the LBL Computer Center. 7600 jobs which frequently access the same tape may reduce their tape hanging charges by using the FETCHMT (Fetch Magnetic Tape) control card. See the BKY Users Handbook subset STAGING for details. The 7600 handling charge is reflected in the 'STAGING CUS' line of the dayfile. The number of tapes mounted on the 6000s appears in the line 'TAPES MOUNTED'.

A handling charge (10 AUS on weekdays and 5 AUS on weekends or holidays) is also made for each queued output file processed at LBL. This includes print, plot, microfilm and punch output. Output printed on the user printers and all files processed remotely are exempt from this handling charge. This charge is not part of the parent job's charge, but is attached directly onto the processed file along with the material charge.

Materials Charge

User jobs are charged for any materials used in processing queued files at LBL. Material charges are not discounted holidays and weekends. This charge is not part of the parent job's charge, but is attached directly onto the processed file along with the associated handling charge (if any). The charge for materials is as follows

<u>Cost</u>	<u>Type of output</u>
0.1 AU	per printed page (user printer included)
.05 AU	per punched card
5.0 AU	per 105 mm fiche
0.2 AU	per 35 mm frame
0.1 AU	per 16mm frame
1.0 AU	per 20 inches of Calcomp plot paper used or per 1 minute of plotting time

PEOPLE YOU MAY NEED TO CONTACT

Service	Name	Room	Bldg.	Phone (ext.)
Consultants		1245	50B	5981 or 843-1009
Establishing an Account	Eric Beals	2232C	50B	5351
Keypunching Service	Verneice Arnett	226	50	6256
Expeditor Service	Dan Mangonon	2249A	50B	5866
Guest cards, Parking Permits	Karlyn Wright or Margaret Yamada	2232	50B	6287
Establishing a Remote Terminal	Don Zurlinden	1145A	50A	6329
Tape Librarian	Jewel Walczak	2249	50B	6218
Obtaining Data Cell Space	Bob Rendler	2274A	50B	5629
Obtaining Chipstore Space	Bob Rendler	2274A	50B	5629
Changing account Numbers, Passwords	Fran Permar	2258	50B	6310
COPE Operator				5311
Computer Operations				6211

The phone number of the main laboratory switchboard is 415/843-2740.

III. DOE-1 PROGRAM

GENERAL

DOE-1 is a public domain computer program for the analysis of energy use in buildings. The program is documented in a user's manual, and a program manual. The program itself and the documentation may be obtained by writing to:

National Energy Software Center, Building 221
Argonne National Laboratory
Argonne, Illinois 60439
Tel: (312) 972-7250
or FTS 972-7250

In addition, the Software Center has a magnetic tape available containing 75 DOE-1 weather files. These files are compatible with CDC systems only.

OVERVIEW

DOE-1 consists of a language (Building Design Language or BDL) and a computational program (LSPE). The computational program is divided into four subprograms: LOADS, SYSTEMS, PLANT, and ECONOMICS. See Fig. 1 for Flow Diagram.

BDL

BDL processes the user input and produces input files (standard files) for LOADS, SYSTEMS, PLANT and ECONOMICS. It writes a control file that tells LSPE which subprograms to run.

LSPE

LSPE reads the control file written by BDL and loads the requested subprograms. See Fig. 2 for overlay and file structure.

LOADS

LOADS reads its standard file and an hourly weather file. It computes hourly space heating and cooling loads by simulating building components (walls, windows, etc.) using a constant space temperature. LOADS writes an hourly loads file and a design file containing peak loads.

SYSTEMS

SYSTEMS reads its standard file, the weather file, the hourly space loads file from LOADS, and the design file produced by LOADS. It recalculates the hourly space loads under variable temperature conditions, simulates the operation of HVAC components (fans, coils, etc.), and produces hourly loads that will be imposed on the primary heating and cooling equipment. It can perform sizing calculations using the information on the design file. It writes an hourly energy loads file and a design file containing peak loads.

PLANT

PLANT simulates the operation of the primary energy conversion equipment (boilers, chillers, etc.). It reads its standard file, the weather file, the hourly file from SYSTEMS, and the design file from SYSTEMS. It can use the information on the design file to perform sizing calculations. It produces output giving the total energy and fuel input to the building, and does economic calculations relating to the plant equipment. PLANT sends a file containing economic information on plant equipment and fuel costs to ECONOMICS.

ECONOMICS

ECONOMICS performs life cycle costing calculations on the building components. It uses economic information from PLANT to produce overall life cycle costs.

FILES

Control File

BDL writes a control file (TAPE94) which is passed to LSPE. The control file tells LSPE the local file name of the weather file (default=WEATHR). It tells LSPE which subprogram to execute next, and the names of its input and output files.

Standard Files

A standard file in DOE-1 is a file passed by the language (BDL) to one of the computational subprograms. It contains user input plus default values rearranged for ease of use by the computational program. For example, the LOADS standard file contains the information given between the INPUT LOADS and END commands in the user's input deck.

Hourly and Design Files

The hourly and design files pass information between the computational subprograms. An hourly file, SYSH11, containing hourly zone heating and cooling loads, is sent from LOADS to SYSTEMS. An hourly file, PLTH11, containing hourly building heating, cooling, and electric demands, is sent from SYSTEMS to PLANT. The design files typically contain peak loads needed for sizing equipment. SYSD11 is passed from LOADS to SYSTEMS. PLTD11 is sent from SYSTEMS to PLANT.*

Keyword Files

LDLKEY, SDLKEY, PDLKEY, and EDLKEY are binary files read by BDL. They contain the keywords, command words, and associated abbreviations

*The number on the end of the file names is added by BDL. For non-parametric runs it will be 1. If the user inputs multiple decks for a single subprogram the standard, hourly, and design files will be numbered sequentially. For instance, for three LOADS decks the standard files would be LS1, LS2, and LS3; the hourly files would be SYSH11, SYSH12, and SYSH13; the design files would be SYSD11, SYSD12, and SYSD13.

for the language overlays LDL, SDL, PDL, and EDL. The files also contain the default values, maxima, and minima for the keywords. The keyword files are fixed input files and cannot be produced or altered by the user.

Weather File

The weather file is a packed binary file containing hourly weather information for one year. It is read by LOADS, SYSTEMS, and PLANT. 75 different weather files are available on 6250 BPI tape (see Fig. 3). To obtain Cincinnati, Ohio, for example, execute the control card

```
GETTAPE,WEATHR=WEATHFILE/CINCINN,18237.
```

The weather file will be on local file WEATHR. This file is not gathered, so delete the SCATTER,IN,,WEATHR. card in the control deck. A sub-sample of weather files is available on PSS; a list may be obtained by executing

```
*6,PSS,NOTAPES
```

```
PSSLIST,,,WEATHR.
```

The user may produce his own weather files by running PACKER on TRY or 1440 weather tapes. See Section IV for details.

Material and Wall Files

BDL reads a card image (formatted) file MATLIB, containing the physical description of various materials. This information can be used by BDL via the LAYERS command to produce wall response factors. See the MATERIALS section of the DOE-1 Users Manual for a list of the materials.

Response factors can also be read directly from the file LDLLIB. This is a card image file output from the program RESFAC. RESFAC is described in the DOE-1 Users Manual, section UTILITY. RESFAC may be obtained by executing

```
FETCHPS,UTILITIES,RESLGO,RESLGO.
```

CONTROL DECKS AND SAMPLE INPUT

A punched control deck for DOE-1 may be obtained by executing the control cards

★LOCAL

FETCHPS,EXECUTIVE,CCARDS,NEWCRDS.

DISPOSE,CCARDS=PU,DT=I,R=[WHATEVER].

The cards will appear in the building 50 I/O area. They will be labeled WHATEVER. Figure 4 shows a listing of the control deck.

SAVING INPUT AND OUTPUT

Rationale

Much computer time and user energy can be saved by storing input and intermediate files on PSS or magnetic tape. The most costly programs to run are LOADS and SYSTEMS. LOADS takes approximately 1 to 1 1/2 CP seconds per zone. SYSTEMS executes in 1/2 to 3/4 seconds per zone. In contrast, PLANT takes 2 - 4 seconds in total, BDL approximately 1/2 second, and ECONOMICS less than 1/10 second. Therefore, if the user is interested in studying the effect of different systems, it will save him significant amounts of money to store the LOADS output and run SYSTEMS Only. Similarly, for multiple PLANT runs on the same system, the output of SYSTEMS should be stored. On the other hand storing standard files is not very useful, as BDL is inexpensive to run.

Storage Strategy

The user's storage strategy should be: store short files on PSS and long files on tape. A short file might be defined as a file containing less than 10,000 words. A file of 10,000 words takes approximately 40 physical record units on PSS or 2 allocation units. A typical small PSS group contains 25 allocation units or approximately 100,000 words.

As an example let us suppose that the user wants to save the output of a two day run of LOADS on example building 3A (LYNCH3A). The two files that must be saved are SYSDI1 and SYSHI1. SYSDI1 is always short. SYSHI1 contains 3 words per zone per hour. Building 3A has 6 zones so SYSHI1 will have $3 \times 6 \times 24 \times 2 = 864$ words, which is short enough to be placed on PSS. A year run, in contrast, would give $3 \times 6 \times 24 \times 365 = 157,680$ words on SYSHI1, and SYSHI1 should be put on tape. In general, design files are short; hourly files for year runs must go on tape; hourly files for several day test runs may be written to PSS.

How to Save and Retrieve

The following control card sequence will write LOADS output to PSS. These cards should be inserted after the LSPE,LC=100000. card in the DOE-1 control deck.

```
REWIND,SYSHI1,SYSDI1.  
GATHER,GLUB,,SYSDI1,SYSHI1.  
LIBRITE,LIBNAME,GLUB/RR,SUBSET,  
GROUP NUMBER,W=OWNER,G=GROUP NAME.  
ENTERPS,LIBNAME,GLUB,SUBSET.  
DELETE,GLUB.
```

To save SYSTEMS output replace SYSDI1 with PLTDI1 and SYSHI1 with PLTDI1. To save PLANT output for multiple ECONOMICS runs, LIBRITE the file ECODI1 only. To re-obtain the files (for systems input) execute:

```
FETCHPS,LIBNAME,QUACK,SUBSET.  
SCATTER,QUACK,,SYSDI0,SYSHI0.  
DELETE,QUACK.
```

These cards should be placed before the LSPE,LC=100000. card in the DOE-1 control deck. Note that the number at the end of the file name must now be zero, not 1. For PLANT input replace SYSHI0 with PLTHI0 and SYSDI0 with PLTDI0.

To save the output of LOADS on 9 track 1600 BPI tape, execute the following control sequence:

COPY, SYSDI1/RR, 1F, SYSHI1/RR, 1F, BLOB.
STAGE, BLOB, D9, NT, W, TAPE NUMBER.

To get the file back execute

STAGE, BLIMP, D9, NT, R, TAPE NUMBER.
COPY, BLIMP/RB, 1F, SYSDIØ.
COPY, BLIMP/BX, 1F, SYSHIØ.

It is often useful to put punched card input on PSS. The input can then be read from PSS and edited on a terminal. The user should read the following deck into the card reader:

Jobcard

★USERPR

COPY, INPUT, BLENCH.

LIBRITE, LIBNAME, BLENCH/RR, SUBSET,

GRP NO., W=OWNER, G=GROUPNAME.

ENTERPS, LIBNAME, BLENCH, SUBSET.

7/8/9

DOE-1 input deck

6/7/8/9

IV. DOE-1 WEATHER PACKAGE

WEATHER PACKING ROUTINE

Summary

This program takes weather data in a number of forms and writes a DOE-1 packed weather file.

Description

This program reads weather data from DOE-1 eight-word files, Test Reference Year (TRY) format tapes, California Thermal Zone (CTZ) tapes, or WX1440 weather tapes. It then creates a new file which is readable by DOE-1. The packed file can then be saved for further use.

Input

All types of files require the same input on the first card:

<u>Card</u>	<u>Clmns</u>	<u>Format</u>	<u>Value</u>
1	1-20	2A10	Station Name
	21-25	I5	Year of data (4 digits)
	26-35	F10.4	Station Latitude
	36-45	F10.4	Station Longitude
	46-50	I5	Time zone (offset from Greenwich Time)
	51-55	I5	Station Number (CTZ, TRY, and WX1440 only)
	56-60	I5	Tape type (see below)

The tape type numbers are:

- 0 - Eight-Word tape (leave field blank)
- 1 - TRY tape
- 2 - CTZ tape
- 3 - WX1440 tape

If a WX1440 tape is being used, the year tells which Julian year to read from the WX1440 tape.

The Eight-Word tapes require no further input.

The TRY, CTZ, and WX1440 tapes require two more cards:

Card	C1mns	Format	Value
2	1-72	12F6.1	Ground temperature for each month in degrees Rankine ($^{\circ}\text{F}+459.7$)
3	1-72	12F6.1	Clearness number for each month

Files:

WEATHR	Original weather data
INPUT	
OUTPUT	
NEWTH	DOE-1 packed weather
TAPE9	Output suitable for CPLPLOT or TVPLOT (see Weather Plotting Routine)

Sample Deck, Weather Packing Routine:

WEATHER PACKING ROUTINE

```

-----+-----1-----+-----2-----+-----3-----+-----4-----+-----5-----+-----6-----+-----7-----+-----8
<JOB CARD>
FETCHMT,WEATHR,99999.          GET ORIGINAL WEATHER FILE
FETCHPS,UTILITIES,PACKIT,PCKLGO.  GET WEATHER PACKING ROUTINE
FBSIZE,WEATHR=0,NEWTH=44.
PACKIT.          EXECUTE PACKING PROGRAM
DELETE,WEATHR,PACKIT.
FBSIZE,IN=44.
GATHER,IN,,NEWTH.          GATHER PACKED FILE TO SAVE SPACE
DELETE,NEWTH.
ENTERPS,MYLIB,IN/RU,NEWTH.
LIBRITE,MYLIB,IN/RU,NEWTH,999,W=JOEUSER.  WRITE GATHERED FILE ON PSS
EXIT.
DUMP,0.
FIN.
RETAIN.
END.
<END-OF-RECORD>
CHICAGO WEATHR      1974      41.78      87.75      614819      1
500.6 498.1 498.9 500.9 506.8 515.4 520.6 523.3 522.4 518.5 512.3 505.9
0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98
<END-OF-JOB>
-----+-----1-----+-----2-----+-----3-----+-----4-----+-----5-----+-----6-----+-----7-----+-----8

```

WEATHER PLOTTING ROUTINE:

Summary

This program writes files suitable for micro-fiche and film.

Description

This is a modified version of CPLPLOT designed especially for DOE-1 files after use of the Weather Packing Routine. It creates monthly plots of weather data, suitable for disposing to micro-fiche or film at LBL.

Files:

TAPE9	File from Weather Packing Routine
OUTPUT	
FILM	Contains weather plots for micro-fiche or film.

Sample Deck, Weather Plotting Routine:

WEATHER PLOTTING ROUTINE

IN ORDER TO USE THE PLOTTER, INSERT THE FOLLOWING CARDS BEFORE THE
'CXIT.' CARD IN THE PACKER CONTROL SEQUENCE

-----1-----2-----3-----4-----5-----6-----7-----8	
DELETE,PACKIT.	
FB SIZE, FILM=174.	
FETCHPS,UTILITIES,PLOTIT,TVPLGO.	GET FICHE PLOTTER
REWIND,TAPE9.	
PLOTIT.	EXECUTE PLOTTING PROGRAM
DISPOSE, FILM=MF,DT=I.	DISPOSE PLOT TO MICRO-FICHE
-----1-----2-----3-----4-----5-----6-----7-----8	

WEATHER REPORT PRINTER

Summary

This program writes a report (W01) of the data contained in a DOE-1 packed weather file.

Description

Given a starting month (M1) and an ending month (M2), this

A-1

Fig. 1. Flow diagram for DOE-1 programs and files. Heavy outline denotes permanent programs. Light outline denotes files.

Note: Files are labeled for nonparametric run

XBL 787-1360

Fig. 2. Overlay and file structure of LSPE.

77.0	FILES ON GETTAPE
ALBANY	NY
ALBUQUERQUE	NM
AMARILLO	TX
ATLANTA	GA
BIRMINGHAM	AL
BISMARCK	ND
BOISE	ID
BOSTON	MA
BROWNSVILLE	TX
BUFFALO	NY
BURLINGTON	VT
CHARLESTON	SC
CHEYENE	WY
CHICAGO	IL
CINCINNATI	OH
CLEVELAND	OH
COLUMBIA	MO
DETROIT	MI
DODGE CITY	KS
EL PASO	TX
FORT W	TX
FRESNO	CA
GREAT FALLS	MT
HOUSTON	TX
INDIANAPOLIS	IN
JACK/FL JACKSONVILLE, FL	
JACK/MS JACKSON, MS	
KANSAS CITY	MO
KUWAIT	
LAKE CHARLES	LA
LASL	NM
LOS ANGELES	CA
LOUISVILLE	KY
LUBBOCK	TX
MADISON	WI
MEDFORD	OR
MEMPHIS	TN
MIAMI	FL
MINNEAPOLIS	MN
NASHVILLE	TN
NEW ORLEANS	LA
NEW YORK	NY
NORFOLK	VA
OKLAHOMA CITY	OK
OMAHA	NE
PHILADELPHIA	PA
PHOENIX	AZ
PITTSBURGH	PA
PORT/ME PORTLAND, ME	
PORT/OR PORTLAND, OR	
RALEIGH	NC
RICHMOND	VA
SACRAMENTO	CA
SALT LAKE CITY	UT
SAN ANTONIO	TX
SAN DIEGO	CA
SAN FRANCISCO	CA
SEATTLE	WA
ST LOUIS	MO
TAMPA	FL

Fig. 3. Weather files in DOE-1 library.

(Fig. 3 cont.)

TULSA	OK
WASHINGTON	DC
CTZ01	
CTZ02	
CTZ03	
CTZ04	
CTZ05	
CTZ06	
CTZ07	
CTZ08	
CTZ09	
CTZ10	
CTZ11	
CTZ12	
CTZ13	
CTZ14	
CTZ15	

THE FIRST CARD IN THIS FILE HAS THE NUMBER OF WEATHER SUBSETS AVAILABLE IN GETTAPE FORMAT. THE FIRST SEVEN CHARACTERS ON THE SUBSEQUENT CARDS ARE THE SUBSET NAME FOR THAT PARTICULAR WEATHER DATA. THE PATHNAME IS 'WEATHFILE/*****' FOR THE CALERDA-READABLE PACKED WEATHER FILE, AND 'FICHEFILE/*****' FOR THE L.B.L. STYLE FICHE/FILM PLOTS OF THE WEATHER DATA.

```

      <JOB CARD GOES HERE>
*NOSTAGE
DISKHOG,5000.
FBSIZE,BDLABS=220,BDL=160,DBGMAP=6,TAPE94=2,LSPEI=270,LSPE=246.
FBSIZE,IN=44,LDLKEY=6,SDLKEY=4,PDLKEY=4,EDLKEY=2,TAPE71=10.
FBSIZE,WEATHR=44,MATLIB=4,LDLLIB=4,PDLLIB=10,CFILE=16,FFILE=2.
FETCHPS,LSPE,BDLABS,BDLABSO.
FETCHPS,BDLLIBS,LDLLIB,<YOUR LDLLIB>.          TO FETCH A LDLLIB
FETCHPS,LSPE,LSPEI,LSPEO.
FETCHPS,WEATHR,IN,<YOUR WEATHER>.
SCATTER,BDLABS.
DELETE,MATLIB,PDLLIB.
RETURN,BDLABS.
BDL,LC=50000.
RETURN,LDLKEY,SDLKEY,PDLKEY,EDLKEY,LDLLIB,MATLIB,PDLLIB,BDL.
RETURN,TAPE81,TAPE82,TAPE83,TAPE84,TAPE71.
SCATTER,LSPEI.
SCATTER,IN,WEATHR.
RETURN,LSPEI,IN.
LSPE,LC=100000.
FILES.
END.

```

Fig. 4. Control deck for operating DOE-1.

program will write a report of all of the hourly data contained in a DOE-1 packed file. It puts two days (48 hours) of data on each page. After the hourly data a summary is given of the data in the monthly headers, as well as a summary of the minimum, maximum, and average values of the wet bulb temperature, dry bulb temperature, humidity ratio, cloud amount, and wind speed.

Input

<u>Card</u>	<u>Clmns</u>	<u>Format</u>	<u>Value</u>	<u>Default</u>
1	1-2	I2	M1	1
	6-7	I2	M2	M1 (12 if M1=1)
2&3	0-50	5A10	TITLE	all blank

Files

INPUT

OUTPUT

WEATHR Contains packed weather information

Sample Deck, Weather Report Printer

WEATHER REPORT PRINTER

```
-----+-----1-----+-----2-----+-----3-----+-----4-----+-----5-----+-----6-----+-----7-----+-----8
<JOB CARD>
FETCHPS,MYLIB,IN/RU,WEATHR.                GET GATHERED WEATHER FILE
FETCHPS,UTILITIES,REPORT,WRPLGO.           GET WEATHER REPORT PRINTER
FBSIZE,IN=44,WEATHR=44.
SCATTER,IN,,WEATHR.                         SCATTER GATHERED FILE
DELETE,IN.
REPORT.
CXTT.
EXIT.
DUMP,0.
FIN.
RETAIN.
END.
<END-OF-RECORD>
02 04
CHICAGO WEATHER FOR 31-STORY OFFICE BUILDING RUN
<END-OF-JOB>
-----+-----1-----+-----2-----+-----3-----+-----4-----+-----5-----+-----6-----+-----7-----+-----8
```

WEATHER CHANGING PROGRAM

Summary

This program allows a user to change values on a DOE-1 packed weather file.

Description

This program allows the user to change the wet bulb temperature, dry bulb temperature, dew point temperature, barometric pressure, wind speed, cloud amount, cloud type, and wind direction. The dew point temperature is not stored on the weather file. However, this value is necessary in order to change the humidity ratio, density, and enthalpy. These three values are recalculated whenever a new dewpoint temperature is input. If the field for any value is blank, the old value is retained. It is not necessary to feed changes in calendar order, as the program sorts the input according to the hour of the year in order to optimize execution. The program checks the data for invalid input. If found, it retains the old data and prints an error message.

Input

<u>Card</u>	<u>Clmns</u>	<u>Format</u>	<u>Value</u>
1	1-2	I2	Month of change
	4-5	I2	Day of change
	7-8	I2	Hour of change
	11-30	2A10	Title (optional)
2	1-10	F10.1	Wet bulb temperature (WBT) °F
	11-20	F10.1	Dry bulb temperature (DBT) °F
	21-30	F10.1	Dew point temperature (DPT) °F
	31-40	F10.1	Atmospheric pressure (PATM) Inches and hundredths of Hg.
	41-50	F10.1	Wind speed (WNDSPD) Knots
	51-60	F10.1	Cloud amount (CLDAMT) 10ths
	61-65	I5	Cloud type (ICLDTY) 0=cirrus, 1=stratus, 2=mixed

66-70 I5 Wind direction (IWNDDR) Integers 0-15,
0=north
each successive integer
increments by 22.5°

It is also possible to change the ground temperature and clearness numbers stored on the tape in the monthly header. In order to do so columns 1-10 of the first card must be blank (a comment may be included in cols. 11-30). The next two cards contain clearness numbers and ground temperatures for each month to be changed. As above, any blank field retains the old value. The ground temperatures are given in degrees Rankine. Both cards must be given, even if only one value is to be changed.

<u>Card</u>	<u>Clmns</u>	<u>Format</u>	<u>Value</u>
1	1-2	I2	zero or blank
	4-5	I2	zero or blank
	7-8	I2	zero or blank
	11-30	2A10	Title (optional)
2	1-72	12F6.0	Clearness numbers
3	1-72	12F6.0	Ground temperatures

Files

INPUT

OUTPUT

WEATHR Original weather

NEWTH Changed weather

Sample Deck, Weather Changing Program

WEATHER CHANGING PROGRAM

```

-----+-----1-----+-----2-----+-----3-----+-----4-----+-----5-----+-----6-----+-----7-----+-----8
<JOB CARD>
FETCHPS,MYLIB,IN/RU,SUBSET.                GET GATHERED WEATHER FILE
FETCHPS,UTILITIES,EDIT,WEDLGO.             GET WEATHER EDITOR
FBSIZE,IN=44,WEATHR=44,NEWTH=44.           SCATTER GATHERED FILE
SCATTER,IN,,WEATHR.
DELETE,IN.
EDIT.
DELETE,WEATHR,EDIT.
REWIND,NEWTH.
GATHER,IN,,NEWTH.                           GATHER NEW WEATHER FILE
DELETE,NEWTH.
ENTERPS,MYLIB,IN/RB,SUBSET.
LIBRITE,MYLIB,IN/RB,SUBSET,999,W=JOEUSER.   WRITE NEW GATHERED FILE ON PSS
CXIT.
EXIT.
DUMP,0.
FIN.
RETAIN.
END.
<END-OF-RECORD>
      FIX ERROR IN MONTHLY HEADER
      1.10 0.95
      551.0      560.1
12 21 02  FIX ERROR DBT
      31.0
02 02 01  HI THERE
32.0      32.0      29.1      7.0
07 12 12  CHANGE INT VALS

                                           1      5
<END-OF-JOB>
-----+-----1-----+-----2-----+-----3-----+-----4-----+-----5-----+-----6-----+-----7-----+-----8

```

V. HOW TO USE AN INTERACTIVE TERMINAL TO MANIPULATE FILES AND RUN DOE-1 JOBS

This writeup is intended to give the first-time DOE-1 user an idea of how to run a DOE-1 job from an interactive terminal. It should be used in conjunction with BKY writeups SESAME and NETED, which give detailed information about the BKY interactive system.

Examples are included in this writeup. User entries are shown in lower case letters. The computer response is shown in capital letters.

GENERAL INFORMATION ABOUT THE SYSTEM

There are three computers at LBL: the CDC 7600, the CDC 6600 ('B' machine) and the CDC 6400 ('C' machine). The 'B' and 'C' machines set up jobs for the 7600. The 7600 then executes the job and returns the output to the 'B' and 'C' machines, which dispose it. No direct communication with the 7600 is possible. An interactive terminal communicates with either the 'B' or the 'C' machine.

There are several commands that can be used on a terminal to find the status of the three machines.

```
>b          (asks the status of the 'B' machine)
>c          (asks the status of the 'C' machine)
>7          (asks the status of the 7600)
```

The terminal will respond with something like this:

```
INPUT Q-131 XEQ-50 MEM-5 TTY-35 etc.
```

which means there are 131 jobs in the input queue, 50 jobs are being executed, 5 jobs are in memory, there are 35 interactive jobs (TTY), etc.

To find the breakdown of instant, rush, normal, and deferred priority jobs, type this:

```
>bq        (for the 'B' machine)
>cq        (for the 'C' machine)
>7q        (for the 7600)
```

To find the general status of the whole system, type this:

```
@
```

USEFUL CONTROLS ON CRT TERMINALS

When this type terminal is turned on, a rectangular block of light will appear continuously on the screen to show you where you are. This block of light can be moved around by simultaneously pressing the CTRL key and one of the keys with a directional arrow on it(+,↓,↑,+). The combination of CTRL and + is useful because if a mistake is made when typing in a line of code this will erase one letter at a time. Once the mistake is removed, the rest of the line can be retyped.

RUB does the same thing as (CTRL and +) but is messier.

SHIFT moves the keys to upper case, like a typewriter.

REPEAT repeats whatever key you are pressing down.

SHIFT and CLEAR pressed simultaneously clear the screen.

LINEFEED erases the line you have just typed.

RETURN sends the line you have just typed to the computer. In the rest of this writeup, it is assumed that you press RETURN after all your line entries.

LOGGING ON TO THE COMPUTER

Your terminal is not connected to the computer until you are logged on. You may log on to either the 'B' or 'C' machine. To log on, type

>lb (to connect to the 'B' machine)

>lc (to connect to the 'C' machine)

If the computer says

ENTER JOBCARD OR ASTOP

type in your jobcard (and, as always, press RETURN). Your jobcard may look something like this:

Jobname,7.123456,programmer name

The '7' in the jobcard will give you normal priority. If you are in a big hurry in the middle of the day, use '14' (and pay twice as much). If you are using the terminal during off-hours, type '3' (and pay half as much). If, instead of writing

ENTER JOBCARD OR ASTOP

the computer had written

NOW RANKED 04 IN LOGIN QUEUE

You have to wait for the other three jobs ahead of yours to log on. You may have to wait a while. The wait may range from less than 5 minutes to more than 15 minutes. If you don't want to wait, type

>drop

and you will be disconnected.

If your account is protected by a password, the computer will ask for your password when your jobcard has been accepted. When you type it in, the computer will not repeat it on the screen.

ENTER PASSWORD (type in password)

If everything is OK, the computer will say

OK-SESAME

You are now logged on and connected to SESAME, the LBL interactive system.

SESAME

For DOE-1 interactive users, SESAME is primarily an easy way to manipulate files (whole programs, data files, input files, etc.). You can fetch files from the program storage system (PSS), store files on PSS, dispose programs to the 7600, create files, change files, destroy files, etc. The BKY writeup SESAME goes into more detail.

General SESAME Commands

To see a list of the files attached to your interactive job, type
files

The computer will list all the file names associated with your job, including the computer generated files CONTROL, INPUT, SESAME, TAPETTY, and OUTPUT. The only computer generated file worthwhile looking at is OUTPUT, which contains information about PSS if you have stored anything using the LIBRITE command (see below).

To fetch a file from PSS (for example, a previously stored DOE-1 input deck), type

fetchps,<libname>,U-name,<subset>

where

<libname> is the PSS library name, <subset> is the library subset, and U-name is the name of the local file that <subset> will be copied onto so that SESAME can work with it.

U-name is whatever name you want it to be. This write-up calls it QUICK. U-name can be 7 characters in length. Once the file is fetched the computer will write

OK-SESAME

If you type

files

you will see that U-name is now a file.

To read, change, or create a file, use NETED, described below.

To dispose a file to the 7600 so it will be executed (for example a file of control cards and BDL input that will run DOE-1) type

dispose,U-name=in

This will dispose your file to the CDC-7600 input queue, the same as if you had read the job in on the card reader. Note that your file must have exactly the same format as if you had used the card reader, except that the password can be omitted. Also, the 7-8-9 card (7, 8, and 9 multipunched in column 1) that is placed between the control deck and the BDL input deck is replaced by EOR (end-of-record). The 6-7-8-9 card at the end of the job is omitted.

To store a file in an existing library on PSS type

librite,<libname>,U-name<subset>,<group no.>,w=<owner>.

To create a new library and store a file in it, type

librite,<newlibname>,U-name,<subset>,g=<group no.>,<group name>,w=<owner>.

The library name can be up to 10 alphanumeric characters in length with no imbedded blanks. U-name and <subset> can be up to 7 alphanumeric characters in length with no imbedded blanks. The <owner> is up to 10 characters in length starting with a non-blank. <owner> can be any user name for a new library. For a library that already exists, the previously used <owner> must be used. The group number

and group name must already exist. They are given to you when you originally request PSS space.

If you want to look at your dayfile as you work on SESAME, type

>y

If you get tired of looking at your dayfile as you go along, type

>n

NETED and POE

NETED and POE subsystems of SESAME used to to create and/or edit files. The BKY writeup NETED is well written and gives a detailed explanation of what it is and how to use it. It is strongly recommended that the user read this writeup. To get a copy, see example no. 7 in the Examples section below. POE is a more sophisticated version of NETED and is more useful and flexible once the user is familiar with NETED. POE documentation exists in library POE, subset DOC.

Examples

User input is in lower case, computer output is capitalized.

1. To log on, create a DOE-1 job file, and store it:

>lb

ENTER JOBCARD OR ASTOP

myjob,7.123456,joe-user

ENTER PASSWORD (type in password, not displayed).

MYJOB01 LOGGED IN

OK-SESAME

neted,quck

QUCK NOT FOUND. INPUT

bldg,7,200.123456,myname

.

.

.

(DOE-1 control cards)

.

.

.

end.(last card of control deck)
eor (separates control deck from BDL input)
.
(BDL input) (loads, systems, plant, economics)
.
eor
.
(period changes NETED from input to edit mode)
EDIT
 (look over file and fix mistakes according to NETED writeup)
save (writes file QUICK, returns to SESAME)
QUICK WRITTEN
OK-SESAME
librite,mylib,quck,subset1,123,w=joe-owner
OK-SESAME
neted,output (diagnostics from librite were stored on the computer
 file OUTPUT)
p 20 (prints the first 20 lines of the file OUTPUT)
 (look over to see if everything is OK.)
quit (returns to SESAME from NETED)
OK-SESAME
Awipe (disconnects the terminal)
 (computer displays the cost of the job on the terminal)

2. To run a job that was stored on PSS (log in as before):

OK-SESAME
fetchps,mylib,quck,subset1
OK-SESAME
dispose,quck=in
BLDG000 QUEUED in (note that the jobname on the jobcard
 in the file QUICK is used by the
 computer, not the filename QUICK)
Awipe

3. To find the status of your submitted job (you don't have to log on):

>>bldg000

The computer may type various things including any of the following:

7600 INPUT QUEUE - BLDG000 (in the input queue)

XEQ-BLDG000 (executing)

IN OUTPUT QUEUES-PR BLDG000 (waiting to be printed)

BLDG000 JOB CONCLUDED

BLDG000 JOB STATUS UNKNOWN (for some reason, your job doesn't exist;
check your spelling)

4. To have the computer hold your DOE-1 output so you can look at it interactively:

insert the word *HOLDOUT in the file containing the jobdeck (example 1)
and remove any *USERPR or *SC= __ __ cards if they are present.

The *HOLDOUT card should be placed immediately after the jobcard
and password card.

After your job has been submitted, if you ask

>>bldg000

and the computer replies

IN OUTPUT QUEUES-BLDG000

your output is ready to be claimed.

To claim it

(log on as before)

OK-SESAME

claim,bldg000

OK-SESAME

neted,bldg000 (so you can look at it)

EDIT.

p 20 (print the file on your terminal until you have seen enough)

.

.

.

quit (to get back to SESAME)

OK-SESAME

If you want to keep the output type,
dispose,bldg000=pr,SC=__,dt=i
where SC=__ tells the computer your site code.
QUICK QUEUED PR
OK-SESAME
if you don't want the output type
delete,bldg000
and the file will be destroyed. (Note. - If you don't delete the
output, it will be printed at the termination of your job.)
OK-SESAME
^wipe

5. To store a card deck on PSS (through the card reader):

<JOBCARD>
\$ID=<password> (if a password is required)
*6,notapes,pss.
copy,input,quck. ("input" is the file after the 7-8-9 card in this job)
librite,<mylib>,quck,<subset>,<group number>,w=<owner>.
7-8-9 (multipunched in column 1)
.
.
.
file to be stored (the computer assumes this is the file "input")
.
.
.
6-7-8-9

The cards in the input deck (between the 7-8-9 and 6-7-8-9 multi-punched cards) are now stored on PSS and can be called up through your terminal.

6. To run DOE-1.4 using the SAMPLE3 sample run input deck:

SAMPLE3, one of the sample run decks, is stored in a compressed form on PSS in library BDLDECKS, subset SAMPLES, along with the

other sample run decks. The subset SAMPLES must be "scattered" in order to produce SAMPLE3 in a usable form. Scattering SAMPLES also produces all the other sample run decks. Since we are only interested in SAMPLE3, the other decks will be deleted after scattering. (For more information on compact file storage using SCATTER and GATHER, see the library HANDBOOK subset COPY.)

SAMPLE3 is a BDL input deck only; it does not have any of the job control cards necessary to call up DOE-1 and execute it. The job control cards are stored in a separate file on library EXECUTIVE, subset NEWCRDT. This file will have to be fetched from PSS and put at the top of SAMPLE3. The control card file is complete with the exceptions that no jobcard is included, and the LDLLIB and WEATHR are unspecified. Consequently these modifications will have to be added to the file. Once the modifications to SAMPLE3 are complete, a copy will be made to be disposed to the 7600 input queue, and the original file will be stored in a "common file" on the 'B' or 'C' machine (explained in more detail below).

(log on)

OK-SESAME

fetchps,executive,tree,newcrdt (gets 1.4 control cards)

OK-SESAME

fetchps,bdldecks,samples,samples (gets compressed form of all

OK-SESAME the sample run decks)

scatter,samples (separates each sample run deck)

OK-SESAME

files

(On files you will observe the computer generated files, together with SAMPLE1-SAMPLE3A, Run1-Run11, and MEDBLDG. We only want SAMPLE3. Deleting superfluous files saves money; don't delete any computer generated files except OUTPUT)

OK-SESAME

delete,samples,sample1,sample2,sample3a,run1,run2,run3,run4,...

```
runl0,runl1,medbldg
OK-SESAME
files                                (you will now see that the deleted
                                     files are gone)
OK-SESAME
neted,sample3                        (to edit SAMPLE3)
EDIT.
p 200                                (to look at the first 200 lines
                                     of SAMPLE3)
t                                    (to get to top)
<TOP OF FILE>
m tree                               (merges the file TREE containing
                                     the control cards at the top of
                                     SAMPLE3)
TREE MERGED
t                                    (to get to top)
p 24                                  (to print the first 24 lines.
                                     Observe the lcoations of
                                     <JOB CARD GOES HERE>
                                     <YOUR LDLLIB>
                                     <YOUR WEATHER> )
t
n
<JOB CARD GOES HERE>
r DOE-RUN,7,200.123456,JOE-USER      (replaces line with real jobcard)
l <your ldllib>                       (to get to the wall library card)
FETCHPS,BDLLIBS,LDLLIB,<YOUR LDLLIB>.
c/<YOUR LDLLIB>/ARCH1                 (to put in the wall library
                                     used in the sample runs)
FETCHPS,BDLLIBS,LDLLIB,ARCH1.
l <your weather>                      (to get to the weather card)
FETCHPS,WEATHR,IN,<YOUR WEATHER>
c/<your weather>/sacrame              (for Sacramento weather)
FETCHPS,WEATHR,IN,SACRAME.
```

w bluesky	(makes a copy of this file on
BLUESKY written	the file BLUESKY)
save	(saves SAMPLE3 with the modifications)
SAMPLE3 WRITTEN	
OK-SESAME	
dispose,bluesky=in	(disposes BLUESKY to the 7600
DOE-RØØ queued in	input queue)
OK-SESAME	
common,sample3	
OK-SESAME	
Awipe	(to disconnect)

In the above example, SAMPLE3 was stored as a common file on the machine the user was logged on. Common files last about 24 hours before being destroyed, so storing a file as a common file assumes that the user will probably want to use the file again on the same day.

The following controls are useful when working with common files:

>cf,sample3	This command asks if SAMPLE3 exists as a common file on either the 'B' or 'C' machine. Several computer responses are possible:
CF NOT IN 6000S-SAMPLE3	This response indicates that SAMPLE3 is no longer a common file.
COMMON FILE IN B-SAMPLE3	SAMPLE3 is a common file on the B machine.
common,sample3	As in the example, this command will make a local file a common file (if a common file by that name does not already exist) <u>or</u> make a common file a local file (if a local file by that name does not already exist). If a file is a common file and you want to access it, this command will make it a local file.
OK-SESAME	Several responses are possible: A local file is now a common file, <u>or</u> a

common file is now a local file (see below).

MFM-SAMPLE3 NOT A LOCAL FILE A local file cannot be made a common
CXIT ERROR file if a common file already exists.
OK-SESAME In this case, SAMPLE3 is already a
common file.
(nothing) If the terminal does not respond at
all, it is probably because neither a
local file nor a common file named
SAMPLE3 exists. To find out, type
>
If the response is
WAIT COMMON FILE-SAMPLE3-6B
then no file by that name exists, and
the original command must be dropped.
>drop
TT DROP
COMMON,SAMPLE3.
DROP VIA TT
EXIT ERROR
OK-SESAME At this point the file can be recreated
by the example shown previously.

7. To get a copy of the BKY writeups NETED and SESAME:

(log on)

OK-SESAME

libcopy,writeups,quck,neted,sesame (to get the writeups)

neted,quck

EDIT.

p 20

(Print the first 20 lines on the CRT.)

p 300

p 10000

.
.
.

etc

quit

OK-SESAME

dispose,quck=pr,sc= __,dt=i (If you want to dispose the file
to a line printer.)

At LBL, use

dispose,quck=pr,pa=lf,dt=i

to get the output on 8 1/2: x 11 paper.

Awipe

8. An easier way to look at a file:

If you just want to look at a file starting at the top and going to the bottom with no editing, there is a better way than using NETED and POE which require more computer time and cost more money. Use the following sequence:

rewind,quck.

OK-SESAME

copy,quck,tapetty (copies the file QUICK onto the file TAPETTY
which is your CRT screen)

If you want to stop the copy so you can look at it, type in any character. The printing will stop. To restart the printing, press the LINE FEED key. To terminate the copy command and return to SESAME, enter:

>drop

This report was done with support from the United States Energy Research and Development Administration. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the United States Energy Research and Development Administration.