CAI CENTER

SYSTEMS MEMO

A PROGRAMMING LANGUAGE\1500 (*APL*\1500)

OPERATOR'S GUIDE

Thomas D. McMurchie and Scott E. Krueger

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13. ABSTRACT

This document describes the procedures necessary for starting, running, and stopping the *APL*\1500 System. Additionally, it describes all system commands that are necessary for the administration of the *APL*\1500 System. Operation of the recording terminal feature which provides a System Log is also described.

This document is a revision of the original Operator's Guide supplied by SRA in 1968 with the first release of the APL System for the 1500. In incorporates a number of extensions to the implementation of APL including file handling capabilities, improved directory operations, and remote terminal execution controls. The features reported here are intended for use only by privileged users of the *APL*\1500 System. Only the system operator or other equally qualified persons should be permitted access to

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ABSTRACT (cont'd.)

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This document describes the procedures necessary for starting, running, and stopping the APL\1500 System. Additionally, it describes all system commands that are necessary for the administration of the APL\1500 System. Operation of the recording terminal feature which provides a System Log is also described.

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ACKNOWLEDGEMENTS

The *APL* language was first defined by K. E. Iverson in A Programming Language (Wiley, 1962) and has since been developed in collaboration with A. D. Falkoff. The *APL*\1500 Terminal System is patterned after the S/360 implementation of *APL* which was written by L. M. Breed, R. D. Moore, and R. H. Lathwell. Moreover, the MAT System for the IBM/1500 (developed by Service Bureau Corporation) provided the basic floating point arithmetic and trigonometric routines, and certain fundamental execution logic. The development of the system was further aided by the disk file-service routines and file-search commands written by H. A. Driscoll.

In the preparation of the original *APL*\1500 Operator's Guide, the authors are indebted to S. S. Pakin and D. L. Krueger for critical reading and assistance in production of the final copy.

The *APL*\1500 system was originally released to users of the IBM 1500 Instructional System from the Computer-Related Instructional Systems Center of Science Research Associates (CRIS) in Chicago. Version two of the system was a more extensively debugged and enhanced (e.g., inclusion of light-pen capability) release of version one. Version three of the *APL*\1500 System has several extensive changes, primarily the inclusion of a dynamically controlled file handling capability. Both versions two and three were the work of Thomas D. McMurchie of the Florida State University's Computer-Assisted Instruction Center, with the encouragement of Duncan N. Hansen, who is the Director of the FSU CAI Center.

The body of the entire document was edited and composed on *APL*\1500 using T. D. McMurchie's implementation of a text processing package developed by M. M. Zyrl and A. P. Mullery (IBM Research).

The authors wish to acknowledge the contributions made by David B. Thomas of the FSU CAI Center in the production of this revised version of the original Operator's Guide for version three of the *APL*\1500 System.

INTRODUCTION

System features

APL\1500 is based upon APL, the language first defined by K. E. Iverson in A Programming Language (John Wiley, 1962). It is further based on the IBM/360 implementation of APL, *APL*\360. *APL*\1500 is an interpretative time-sharing system that builds upon the array operations and structural integrity of APL to provide a system with the following salient characteristics:

Simple, uniform rules of syntax

Use of common symbols for ordinary arithmetic operations

Free-form decimal input

A large set of primitive operators

Use of defined functions (programs) with the same facility and syntactic variety as primitive operators

An immediate-execution mode completely free of unnecessary keywords

A comprehensive, integrated set of system commands for managing workspaces and other essential functions

Ability to dynamically manipulate large data bases

Three levels of security; account numbers, workspaces, and programs can be individually locked against use or display

A built-in plot routine

Ability to have CRT and typewriter devices as a single instructional station

Visual fidelity between hard copy and transmitted entries, which ensures reproducibility of results

Succinct diagnostic reports

APL\1500 is a conversational multi-terminal system that was developed at the CRIS Center of SRA. It was written as a stand-alone program to replace the MAT package provided with the IBM/1500 system. Its purpose is to combine the simplicity, power, and conciseness of the *APL*\360 system with the special hardware features of the 1500 -- the CRT display unit and the film projector unit. The *APL*\1500 system supports up to 32 terminals. Minimum configuration:

32K 1130 (or 1800) CPU;

1502 Display Control Unit;

2310 Disk Drive;

1132 (or 1443) Printer;

1442 Card Read-Punch;

1518 Typewriters and/or 1510 CRTs with keyboard; and optionally 1512 Film Projectors, and/or 1510 light pens.

APL\1500 is now running on IBM/1130 and IBM/1800 based 1500 Systems. Furthermore, the same *APL*\1500 System will run on either the IBM/1800 or IBM/1130 with no modifications. CPU usage will be approximately 30 percent higher with an IBM/1130 based system than on an IBM/1800 based system with equal core storage cycle times due to hardware considerations.

Average reaction time of an IBM/1800 based system (i.e., time to respond to trivial requests from a terminal) with 12 stations in immediate execution mode is generally less than one second. With light function execution usage, most such responses are essentially instantaneous; when heavily loaded, there are occasional delays of as much as six seconds.

The time for serving non-trivial requests naturally varies according to the extent to which the CPU must be shared during the computation. Because the primitive operations of APL are defined on arrays, relatively little interpretive overhead is needed for many large computations, and the actual CPU time used for a typical immediate execution mode computation may run from 10 to 30 times that for efficiently compiled code; but the overall efficienty is likely to be comparable, if not superior, to batch processing in many applications if the usual compiling and loading times for batch work are taken into account. If debugging time is included, the advantage of interpretive APL becomes even greater.

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PART 1

STARTING, RUNNING AND STOPPING THE APL SYSTEM

This part describes the procedures necessary for starting, running and stopping the *APL*\1500 System.

STARTING THE APL SYSTEM

Initial Program Loading (IPL) is accomplished by using the APL/IPL card deck which is supplied with the *APL*\1500 System. The first system start-up procedure differs slightly from subsequent IPL procedures, and these differences are noted where appropriate.

To start the *APL*\1500 System:

1. Press the IMMEDIATE STOP and RESET keys on the console.

2. Mount and ready the *APL*\1500 disk packs. If this is the first IPL for this system, the *APL*\1500 System Pack must be mounted on drive 0. To configure the system for the desired number of drives, see *)CONFIGURE*, Part 2 of this manual.

3. NPRO the 1442 card reader, put the APL/IPL card deck in the hopper, and ready the reader.

4. Set the console Data Entry Switches to the binary number of the physical disk drive on which the *APL*\1500 System Pack is mounted (see item 2 above).

5. Press the PROGRAM LOAD key on the console. The system should come to a WAIT at memory location 0175 (hexadecimal).

6. Sign on (see GAINING ACCESS, Part 1 of the *APL*\1500 User's Guide). If this is the first IPL for this system, the only user registered is 314159; this is the SYSTEM OPERATOR number, and it is privileged. To register additional *APL*\1500 users, see *)ADD* and *)ADDP*, Part 2 of this manual.

7. Set the time and date (see *)TIME* and *)DATE*, Part 2 of this manual). *APL*\1500 is now running.

If this is the first IPL for this system, a reconfiguration should be done to optimize disk storage and core utilization. For the details of reconfiguring the *APL*\1500 system, see *)CONFIGURE*, Part 2 of this manual.

RUNNING THE APL SYSTEM

The *APL*\1500 System is designed to run with minimal operator intervention. Subsequent to completion of the IPL procedure described in the previous section, the APL system will run with no further attention. The primary duties of an *APL*\1500 System Operator are the following:

1. Changing APL user packs when required.

2. Performing system administration functions, such as adding APL users, when required (see Part 2 of this manual).

3. Monitoring messages received at the recording terminal (see The Recording Terminal, Part 3 of this manual).

A disk drive must not be removed from ready status while an input or output transfer is in progress on that drive. To prevent the possibility of incomplete disk transfers, the system operator should insure that the APL system is quiescent (in a WAIT condition) when removing APL user packs from ready status. If necessary, user execution may be temporarily halted at all active ports (see *)HALT* and *)RESTART*, Part 2 of this manual). The APL System Pack and Swap Pack must never be removed from ready status while *APL*\1500 is running.

STOPPING THE APL SYSTEM

The *APL*\1500 System can be stopped only when no users are signed on. The suggested procedure for stopping the APL system is:

1. Notify all users of the time at which the APL system will be stopped; this may be done via the *)HIPA* command.

2. Request that all users still signed on at the indicated stopping time sign off; this may be accomplished with the *)PA* command. When the APL system is quiescent (in a WAIT condition) the number of signed-on users is displayed in both the console A and Q registers.

3. After a final warning, intransigent users may be signed off via the *)BOUNCE* command. When all other users have signed off, the system operator should sign off.

4. When all APL users have signed off, the system may be stopped by pressing the IMMEDIATE STOP key on the CPU console.

The *APL*\1500 System is now stopped.

PART 2

PRIVILEGED SYSTEM COMMANDS

A privileged user has access to all of the APL operations described in this section, in addition to those available to the normal user (see the *APL*\1500 User's Guide).

This part describes the system commands that are necessary for the administration of the *APL*\1500 System. Since these commands are of a supervisory nature, they are considered confidential and are meant for privileged users only.

Privileged system commands may be grouped into six classes with regard to their effect on the state of the system:

1. Communication commands effect transmission of messages to groups of terminals.

2. Status definition commands affect the state of system parameters.

3. Account management commands affect the state of user libraries.

4. File management commands affect the state of APL data files.

5. Inquiry commands provide information about the status of the *APL*\1500 system without affecting the state of the system.

6. Port management commands affect the status of users at a group of terminals.

The rules pertaining to the entry of privileged system commands are the same as those for the system commands described in Part 2 of the *APL*\1500 User's Guide.

If a command cannot be executed, an appropriate trouble report will be displayed. The most common report is *INCORRECT COMMAND*. This report will be given if the user is not privileged, or the command was incomplete, misspelled, modified incorrectly, or otherwise malformed.

The first user to sign on the system must set the time and the date to fully activate the *APL*\1500 System. Until the)*TIME* and)*DATE* commands have been executed, all other system commands, including attempted sign-ons by other users, will yield the report: *TIME AND DATE NOT SET*.

The following table summarizes the privileged system commands. The use of parameters enclosed in brackets is optional; the default option is given with the command description.

PRIVILEGED SYSTEM COMMANDS

COMMAND	PURPOSE
)*HI* [text]	Send text to user at sign on.
)*PA* [text]	Send text to all signed on users.
)*HIPA* [text]	Send text as both)*HI* and)*PA*.
)*NOTICE* [text]	Send text to all operational terminals.
)*TIME* hour minute second	Reset the system clock.
)*DATE* month day year	Reset the date.
)*OPERATOR* port	Temporarily re-assign the recording terminal.
)*CONFIGURE*	Reconfigure the *APL*\1500 system.
)*CHAIN* pack	Sort, compress, and chain the directory on the logical pack specified by 'pack'.
)*DEFINE* file name pack [access]	Create an empty file 'file' with description 'name' and public access code 'access' (assumed 0 if elided) on logical pack 'pack'.
)*EXPUNGE* file	Delete the file specified by 'file'.
)*ENABLE* file acctno	Add 'file' to the list of private files for the user specified by 'acctno'.
)*DISABLE* file acctno	Delete 'file' from the list of private files for the user specified by 'acctno'.
)*ACCESS* file access	Change the public access code of the file specified by 'file' to 'access'.

COMMAND	PURPOSE
)*ADD* acctno name pack	Add user 'name' with account number 'acctno' to logical pack 'pack'.
)*ADDP* acctno name pack	Add privileged user 'name' as)*ADD*.
)*DELETE* acctno	Delete user specified by 'acctno'.
)*FILES* [acctno]	List the private files of the user specified by 'acctno'. If the account number is elided, the user's account number is assumed.
)*USERS* file	List the account numbers for which 'file' is a private file.
)*PORTS*	List information about all active users.
)*FUSE*	List the file which is selected at each port.
)*PEOPLE* [pack]	List information about the users assigned to logical pack 'pack'. Information will be listed for all users if 'pack' is elided.
)*CATALOGUE* [pack]	List information about files as)*PEOPLE*.
)*WHO* list of acctno's	List information about the users specified in the list of account numbers.
)*REPORT* list of files	List information about files as)*WHO*.
)*PACKS*	List the logical numbers of the disk packs which are mounted and ready.
)*BOUNCE* list of ports	Sign off users on ports specified in list.
)*HALT* list of ports	Halt execution at ports specified in list.
)*RESTART* list of ports	Restart execution at ports specified in list.

COMMUNICATION COMMANDS

Messages can be received by a terminal only when its keyboard is locked. All messages sent by the commands of this class will be prefixed with *OPR:*. Text length is limited to 76 characters. Messages sent to a CRT will appear at the bottom of the screen and are limited to a display of 34 characters.

When communication commands reference all terminals, the source terminal is included as a target terminal. This message reflection constitutes the normal system response.

The only trouble report for this class of commands is *INCORRECT COMMAND*.

SEND TEXT TO TERMINALS AT SIGN-ON: *)HI*
Enter *)HI* followed by a space and the desired text.

Effect:
The entered text will be displayed to users as they sign on. The text will not be displayed to any users who are already signed on when the *)HI* command is given. If no text is entered, any previous *HI* message will be deleted.

SEND TEXT TO ALL SIGNED ON TERMINALS: *)PA*
Enter *)PA* followed by a space and the desired text.

Effect:
The entered text will be sent to all terminals that are signed on.

SEND TEXT AT SIGN-ON AND TO ALL SIGNED ON TERMINALS: *)HIPA*
Enter *)HIPA* followed by a space and the desired text.

Effect:
This command simultaneously acts as both *)HI* and *)PA*.

SEND TEXT TO ALL TERMINALS: *)NOTICE*
Enter *)NOTICE* followed by a space and the desired text.

Effect:
The entered text will be sent to all configured and operational terminals. If the port configuration includes both a typewriter and CRT, the CRT will receive the message.

ACCOUNT MANAGEMENT COMMANDS

The commands in this class effect the addition and deletion of APL\1500 users.

ADD A USER TO THE SYSTEM: *)ADD*
Enter *)ADD* followed by a space, a 1 to 6 digit account number, a space, a 1 to 24 character user name, a space, and the logical number of the disk pack where the user's library will reside.

Effect:
The user name, account number, and pack number will be entered into the system directory and one workspace (3 cylinders) will be reserved on the designated pack.

Trouble reports:
PACK ERROR
Either the designated disk pack is not mounted and ready, or the designated disk pack is full. See *)CHAIN*.

ACCOUNT ALREADY EXISTS
The designated account is already registered.

SYSTEM DIRECTORY FULL
The System Pack User's Directory is full (maximum of 992 entries).

ADD A PRIVILEGED USER TO THE SYSTEM: *)ADDP*
Enter *)ADDP* followed by a space, a 1 to 6 digit account number, a space, a 1 to 24 character user name, a space, and the logical number of the disk pack where the user's library will reside.

Effect:
The effect of the *)ADDP* command is the same as that of the *)ADD* command except that the account number is privileged.

Trouble reports:
PACK ERROR
see *)ADD*

ACCOUNT ALREADY EXISTS
see *)ADD*

SYSTEM DIRECTORY FULL
see *)ADD*

DELETE A USER FROM THE SYSTEM: *)DELETE*
Enter *)DELETE* followed by an account number.

Effect:
The designated account will be deleted from the system.

Trouble reports:

PACK ERROR
The disk pack on which the user's library resides is not mounted and ready.

ACCOUNT NOT FOUND
The designated account does not exist.

ACCOUNT IN USE
The designated account is in use at some port.

FILE NOT DISABLED
One or more of the designated user's private files have not been disabled.

FILE MANAGEMENT COMMANDS

The commands in this class effect the creation, deletion, and apportionment of *APL*\1500 data files. The structure and use of *APL*\1500 files is described in Part 3 of the *APL*\1500 User's Guide.

DEFINE A FILE: *)DEFINE*

Enter *)DEFINE* followed by a space, a 1 to 6 character alphanumeric file name, a space, a 1 to 24 character description of the file, a space, and the logical number of the disk pack where the data file will reside; then, optionally, the public access code for this file.

Effect:
The file name, description, pack number, and public access code (assumed 0 if elided) will be entered into the system directory and an empty data file (1 cylinder) will be created on the designated disk pack. For a description of the public access code, see *)ACCESS*.

Trouble reports:

PACK ERROR
see *)ADD*

FILE ALREADY EXISTS
The designated file is already registered.

SYSTEM DIRECTORY FULL
see *)ADD*

DELETE A FILE FROM THE SYSTEM: *)EXPUNGE*

Enter *)EXPUNGE* followed by a 1 to 6 character alphanumeric file name.

Effect:
The designated file will be deleted from the system.

Trouble reports:

PACK ERROR
The disk pack on which the designated file resides is not mounted and ready.

FILE NOT FOUND
The designated file does not exist.

FILE IN USE
The designated file is selected at some port.

FILE NOT DISABLED
The designated file is enabled as a private file for one or more users.

ENABLE A PRIVATE FILE FOR AN ACCOUNT: *)ENABLE*

Enter *)ENABLE* followed by a space, a 1 to 6 character alphanumeric file name, a space, and a 1 to 6 digit account number.

Effect:

The designated file will be added to the list of private files for the designated account.

Trouble reports:

FILE NOT FOUND
see *)EXPUNGE*

ACCOUNT NOT FOUND
see *)DELETE*

FILE NOT DISABLED
The designated file is already a private file for the designated account.

FILE RATION EXCEEDED
The designated account has the maximum of 40 private files.

ACCOUNT RATION EXCEEDED
The designated file is a private file for the maximum of 40 accounts.

DISABLE A PRIVATE FILE FOR AN ACCOUNT: *)DISABLE*

Enter *)DISABLE* followed by a space, a 1 to 6 character alphanumeric file name, a space, and a 1 to 6 digit account number.

Effect:

The designated file will be deleted from the list of private files for the designated account.

Trouble reports:

FILE NOT FOUND
see *)EXPUNGE*

ACCOUNT NOT FOUND
see *)DELETE*

FILE NOT ENABLED
The designated file is not a private file for the designated account.

CHANGE THE PUBLIC ACCESS OF A FILE: *)ACCESS*

Enter *)ACCESS* followed by a space, a 1 to 6 character alphanumeric file name, a space, and the new public access code.

Effect:

The public access code for the file designated by 'file' is set to the value 'access'. The public access code specifies the permitted level of public access for the file. If the access code is zero, the file is private and may be referenced only by users for whom it has been enabled. If the access code is positive but less than 64, then it is determined by the sum of the following values:

Value	Operation permitted
1	Ascertain
2	Read
4	Hold/Release
8	Create
16	Replace
32	Erase

For example, an access code of 11 will allow public users to perform ascertain, read, and create operations; all other file operations attempted by public users will yield the report: *DOMAIN ERROR*. Private users (users for whom the file has been enabled) have an implicit access code of 63; i.e., all file operations are valid for private users of a file.

Access codes changed by this command become effective only when the specified file is selected.

INQUIRY COMMANDS

The commands in this class are concerned with the display of information about users of the *APL*\1500 System. These commands have no effect on the state of the system. Execution of any command in this class may be interrupted by an attention signal.

LIST INFORMATION ABOUT ALL APL USERS:)*PEOPLE*

Enter)*PEOPLE* followed, optionally, by a space and the logical number of a disk pack.

Response:

Information about the users who are registered on the specified disk pack will be listed. If the logical pack number is elided, information will be listed for all APL users. The following information about the specified users will be listed:

1. User account number.
2. Privileged user indicator (* if privileged).
3. 1 to 20 character user name or description.
4. Logical pack number of user workspace.
5. Sector address of user workspace.
6. Cumulative connect time as of last sign-off.
7. Cumulative latency as of last sign-off.
8. Cumulative CPU time as of last sign-off.
9. Date of last sign-off.

If the listing is obtained on a CRT, only items 1 through 5 will be displayed. The listing is not affected by the setting of the line width.

LIST INFORMATION ABOUT SPECIFIED APL USERS:)*WHO*

Enter)*WHO* followed by a space and one or more account numbers, each separated by a space.

Response:

The account numbers of the specified users will be listed with the same information as given by the)*PEOPLE* command.

Trouble report:

nnnnnn *NOT FOUND*

The indicated number is not an account number. Execution of the command is not halted upon occurrence of this error.

LIST INFORMATION ABOUT ALL SIGNED-ON USERS: *)PORTS*

Enter *)PORTS*

Response:

All signed-on users will be listed with port numbers and the same information as given by the *)PEOPLE* command.

LIST INFORMATION ABOUT ALL APL DATA FILES: *)CATALOGUE*

Enter *)CATALOGUE* followed, optionally, by a space and the logical number of a disk pack.

Response:

Information about the data files that are registered on the specified disk pack will be listed. If the logical pack number is elided, information will be listed for all *APL\1500* data files. The following information about the specified data files will be listed:

1. File name.
2. Public file indicator (* if access code positive).
3. 1 to 20 character file description.
4. Count of users for whom this file is enabled.
5. Public access code.
6. Logical pack number of the data file area.
7. Sector address of the data file area.
8. Date of creation of the data file.

If the listing is obtained on a CRT, only items 1 through 5 will be displayed. The listing is not affected by the setting of the line width.

LIST INFORMATION ABOUT SPECIFIED APL DATA FILES: *)REPORT*

Enter *)REPORT* followed by a space and one or more data file names, each separated by a space.

Response:

The specified data files will be listed with the same information as given by the *)CATALOGUE* command.

Trouble report:

ccccc *NOT FOUND*

The indicated name is not a data file name. Execution of the command is not halted upon occurrence of this error.

LIST THE DATA FILES CURRENTLY IN USE: *)FUSE*

Enter *)FUSE*

Response:

The names of all currently selected data files and the numbers of the ports at which they are selected will be listed.

LIST THE PRIVATE DATA FILES FOR AN ACCOUNT: *)FILES*

Enter *)FILES* followed by a space and a 1 to 6 digit account number.

Response:

The names of all the private files (files which have been enabled) for the specified account will be listed.

Trouble report:

ACCOUNT NOT FOUND

see *)DELETE*

LIST THE ACCOUNTS FOR WHICH A FILE IS PRIVATE: *)USERS*

Enter *)USERS* followed by a space and a 1 to 6 character alphanumeric file name.

Response:

The account numbers of all the private users of the specified file (users for whom the file has been enabled) will be listed.

Trouble report:

FILE NOT FOUND

see *)EXPUNGE*

LIST THE LOGICAL NUMBERS OF MOUNTED DISK PACKS: *)PACKS*

Enter *)PACKS*

Response:

The status of each configured physical disk drive will be listed. If a drive is ready, the logical number of the mounted disk pack will be given; otherwise, the status *'NOT READY'* will be indicated.

PORT MANAGEMENT COMMANDS

The commands of this class affect the status of users at remote ports. These commands should be used with caution, since their use may prevent the successful completion of activity at the affected ports.

The only trouble report for this class of commands is *INCORRECT COMMAND*.

REMOTELY SIGN OFF USERS: *)BOUNCE*

Enter *)BOUNCE* followed by a space and one or more port numbers, each separated by a space.

Effect:

The specified terminals will be signed off. This command will not sign off the originating terminal. The bounce command should be used with caution, since it performs as a remotely issued *)OFF* and all work done in the user's active workspace will be lost.

HALT EXECUTION AT SIGNED ON PORTS: *)HALT*

Enter *)HALT* followed by a space and one or more port numbers, each separated by a space.

Effect:

Program execution will be halted at the specified terminals. This command has no effect upon processing of input/output commands which have already been loaded into the system buffer. Execution will not be halted at the originating terminal. Attempts to halt execution at signed-off ports will be ignored. Halted execution may be resumed by the command *)RESTART*.

RESTART EXECUTION AT SIGNED ON PORTS: *)RESTART*

Enter *)RESTART* followed by a space and one or more port numbers, each separated by a space.

Effect:

Program execution (which has been suspended by the halt command) will be resumed at the specified terminals.

STATUS DEFINITION COMMANDS

The commands in this class generally affect the setting of system paramteres.

SET THE DATE: *)DATE*

Enter *)DATE* followed by a space, the number of the month, a space, the day of the month, a space, and the last two digits of the year.

Effect:

The date will be set to the designated value. This command is not privileged until after it has been executed for the first time.

Response: None.

SET THE TIME OF DAY:)*TIME*

Enter)*TIME* followed by a space, the number of hours past midnight, a space, the number of minutes past the hour, a space, and the number of seconds past the minute.

Effect:

The time of day will be set to the designated value. This command is not privileged until after it has been entered for the first time. The time command can not be executed if more than one user is signed on. Attempts to reset the system clock while more than one user is signed on will yield the report: *INCORRECT COMMAND*

Response: None.

TEMPORARILY RE-ASSIGN THE RECORDING TERMINAL:)*OPERATOR*

Enter)*OPERATOR* followed by a space and the port number that will designate the recording terminal.

Effect:

All messages sent to the recording terminal will be directed to the designated port (see The Recording Terminal, Part 3 of this manual). This definition remains in effect until this command is entered again or until the next IPL.

Response: None.

CONDENSE AND CHAIN PACK DIRECTORY:)*CHAIN*

Enter)*CHAIN* followed by a space and the logical number of an *APL*\1500 disk pack.

Effect:

The pack directory (volume table of contents) of the specified disk pack will be sorted, condensed and chained across sector boundries. The data areas (workspaces, files, etc.) on the designated disk pack will not be affected. This command should be entered whenever execution of the commands)*ADD*,)*ADDP*, or)*DEFINE* yields the trouble report *PACK ERROR* when the designated disk pack is mounted on a configured drive and ready. The space recovered by consolidation of consecutive unused disk areas and sector chaining may permit more efficient use of available disk space.

Execution of the chain command prohibits subsequent use of the designated disk pack as the Swap Pack. This restriction does not apply to the System Pack or any other disk pack which has been used previously as the Swap Pack. See)*CONFIGURE*.

Response: None.

Trouble report:
PACK ERROR
The designated disk pack is not mounted on a configured drive and ready.

RECONFIGURE THE APL SYSTEM: *)CONFIGURE*
Enter *)CONFIGURE*

Effect:
The completed configuration will take effect at the next IPL.

Response:
The latest configuration is displayed (e.g., the initial *APL\1500* configuration):

```
  CONFIGURATION  10/01/68  00:00:00
PACKS:1   SWAP:01500  TERMS:32  OPR:00
  (T=TYPEWRITER  C=CRT  F=FILM  P=PROBE)

00: TCFP  01: TCFP  02: TCFP  03: TCFP
04: TCFP  05: TCFP  06: TCFP  07: TCFP
08: TCFP  09: TCFP  10: TCFP  11: TCFP
12: TCFP  13: TCFP  14: TCFP  15: TCFP
16: TCFP  17: TCFP  18: TCFP  19: TCFP
20: TCFP  21: TCFP  22: TCFP  23: TCFP
24: TCFP  25: TCFP  26: TCFP  27: TCFP
28: TCFP  29: TCFP  30: TCFP  31: TCFP
 DO YOU WANT TO RECONFIGURE?
```

At this point the system response is ended, and a dialogue with the *CONFIGURE* routine will begin. If *NO* is entered, the command will be terminated and the result will be nothing more than a display of the current configuration. If *YES* is entered, the *CONFIGURE* routine continues by asking the following questions:

HOW MANY DISK DRIVES?
Enter the number of disk drives attached to the system. Before the next IPL, each disk pack essential to the operation of *APL\1500* may be mounted on any disk drive whose physical number is less than the entered value. If a blank entry is given, the prior definition remains in effect.

LOGICAL NUMBER FOR SWAP PACK?
Enter the logical pack number of a new swap pack (1-32766). If a blank entry is given, the prior definition remains in effect. The new swap pack must be mounted on a configured drive and ready; otherwise, the prior swap pack definition remains in effect (therefore, it is impossible to change the swap pack assignment on the first reconfiguration). After the number has been accepted, 96 contiguous cylinders will be reserved on the new swap pack. If the 96 contiguous cylinders of free space cannot be found, the previous definition remains in effect (a pack cannot be used as the swap pack if its pack directory has been chained; see)*CHAIN*). Once a disk pack has been used as a swap pack, the space reserved for the swap area cannot be recovered.

HIGHEST CONFIGURED TERMINAL NUMBER?
Enter the value of the highest numbered terminal (0-31). If the entry is blank, the previous definition remains in effect. There will be no devices configured at ports numbered higher than the entered value.

TERMINAL nn *CONFIGURATION?*
This question is repeated until nn has been incremented from 00 through the value of the highest numbered terminal. Each entry defines those devices which are at the indicated port. The possible entries are:

C	Configure for CRT.
T	Configure for typewriter.
TC	Configure for typewriter and CRT.
CF	Configure for CRT and film.
TF	Configure for typewriter and film.
CP	Configure for CRT and probe.
CFP	Configure for CRT, film and probe.
TCF	Configure for typewriter, CRT and film.
TCP	Configure for typewriter, CRT and probe.
TCFP	Configure for typewriter, CRT, film and probe.
X	There is no device at this port.
blank	Leave the previous configuration for this port in effect.

OPERATOR'S TERMINAL NUMBER?
Enter the port number (0 through the highest terminal number) of the recording terminal. If the entry is too large, the question will be repeated. If the entry is blank, the prior definition remains in effect. The recording terminal may be assigned to a port within the configuration which has no devices. See The Recording Terminal, Part 3 of this manual.

CONFIGURATION COMPLETED AT NEXT IPL.
Indicates the conclusion of the *)CONFIGURE* routine. Below is an example of a dialogue:

```
HOW MANY DISK DRIVES?   5
LOGICAL NUMBER FOR SWAP PACK?  1498
HIGHEST CONFIGURED TERMINAL NUMBER?  7
TERMINAL 00 CONFIGURATION?   TC
TERMINAL 01 CONFIGURATION?   X
TERMINAL 02 CONFIGURATION?   CFP
TERMINAL 03 CONFIGURATION?
TERMINAL 04 CONFIGURATION?   T
TERMINAL 05 CONFIGURATION?   CP
TERMINAL 06 CONFIGURATION?   C
TERMINAL 07 CONFIGURATION?   TF
OPERATOR'S TERMINAL NUMBER?
 CONFIGURATION COMPLETED AT NEXT IPL.
```

The configure command should be executed again to get a new listing of the current configuration. The time and date of the last configuration is output on the first line of the display.

```
  )CONFIGURE
   CONFIGURATION 07/01/71  15:23:25
PACKS:5   SWAP:01498  TERMS:08  OPR:00
  (T=TYPEWRITER  C=CRT F=FILM P=PROBE)

00: TC     01:        02: CFP    03: TCFP
04: T      05: CP     06: C      07: TF
08:        09:        10:        11:
12:        13:        14:        15:
16:        17:        18:        19:
20:        21:        22:        23:
24:        25:        26:        27:
28:        29:        30:        31:
 DO YOU WANT TO RECONFIGURE?  NO
```

PART 3

THE *APL*\1500 RECORDING TERMINAL

APL\1500 provides for a recording terminal which serves as a System Log and as a common point of communication for *APL*\1500 users. The recording terminal operates like any other APL terminal with the following exceptions:

1. A report of all sign-ons and sign-offs is logged on the recording terminal.

2. Messages transmitted via the *)OPRR* command (see Part 2 of the *APL*\1500 User's Guide) will be received at the recording terminal.

3. All messages originating at the recording terminal are prefixed by *OPR:*, instead of the port number of that terminal.

Messages directed to the recording terminal will be output on the typewriter if it is operational and configured; otherwise, these messages will be displayed on the CRT screen if it is operational and configured. If neither of these conditions is satisfied, the messages are lost. No warning report is issued.

Since messages to the recording terminal can be received only when the keyboard is locked, it is important that the keyboard of the recording terminal be kept locked unless a response to an input wait is immediately forthcoming. If sign-on and sign-off messages or messages to the System Operator are delayed for an extended period of time, the performance of the *APL*\1500 system may be seriously degraded. This situation, should it arise, can be corrected by completing the pending input request. The function *Q* listed below can help avoid this problem by allowing output to occur while a user is signed on. *Q* can be interrupted when desired with an attention signal.

```
     ∇Q
[1]  ⎕DL 900
[2]  →1
     ∇
```

Before the first reconfiguration of the *APL*\1500 System, the recording terminal is assigned port number 0. The standard port assignment of the recording terminal may be changed for a particular installation during reconfiguration (see *)CONFIGURE*, Part 2 of this manual). The assignment of the recording terminal may be temporarily changed by the command *)OPERATOR* (see Part 2 of this manual). This reassignment remains in effect until overridden by another *)OPERATOR* command or IPL. Installations with a limited number of terminals may wish to use *APL*\1500 without the recording terminal feature. This may be accomplished by assigning the recording terminal to a configured, but nonexistent port.

PART 4

SYSTEM ERRORS

A System Error is an internal failure of the *APL\1500* system which is detected by the APL interpreter during execution. When a system failure is detected, a register dump and *SYSTEM ERROR* report are output, and a clear workspace is activated. A copy of all work preceding the Syster Error should be given, with the register dump, to the system manager.

Disk errors also result in System Error reports; they have the following format:

```
500R DSSS XXXX XXXX XXXX XXXX 6962
SYSTEM ERROR
```

where R and DSSS represent error code indicators.

CODE (R)	PARAMETER (DSSS)	ERROR
0	Logical Pack	The logical pack numbered DSSS (hexadecimal) is not mounted. This is usually the System Pack (DSSS=05DC) or the Swap Pack. Mount the specified pack and continue.
2	Drive/Sector	The drive specified by D is not ready. Ready the specified drive and continue.
3	Drive/Sector	A disk error has occurred while attempting to seek to the sector specified by SSS (hexadecimal) on the drive specified by D.
5	Drive/Sector	A disk read error has occurred at the sector specified by SSS (hexadecimal) on the drive specified by D.
6	Drive/Sector	A disk write error has occurred at the sector specified by SSS (hexadecimal) on the drive specified by D.

Disk errors 5003, 5005, and 5006 indicate hardware errors, and the failing drive should be examined by an IBM Customer Engineer.