

Information Management Pac

HP-83/85

Current mass storage name: IMP
 Current data file name: SALES
 Enter search conditions?
 REGION=EASTERN
 ?
 PRODUCTS=ALL
 ?
 Current mass storage name: IMP
 Current data file name: TEST
 Select option:
 NEW-FILE EXTEND DONE
 CREATE UPDATE SEARCH HELP

—ENGINEERING
 —OTHER
 —BUSINESS

CITY	STREET	STATE	ZIP	PHONE	SERVICE
HALLINGFORD	47 BARNES INDUSTRIAL ROAD, BARNES PARK SOUTH	CONNECTICUT			NO
HANOVER	7121 STANDARD DR., PARKWAY INDUSTRIAL CENTER	MARYLAND			NO
ROCKVILLE	2 CHOKE CHERRY ROAD	MARYLAND		370	NO
LEXINGTON	32 HARTWELL AVE.	MASSACHUSETTS		8960	NO
PARAMUS	W. 120 CENTURY ROAD	NEW JERSEY		65-5000	NO
EATONTOWN	CRYSTAL BROOK PROFESSION BLDG., ROUTE 35	NEW JERSEY		542-1384	NO
ALBANY	6 AUTOMATION LANE, COMPUTER PARK	NEW YORK	12205	318/458-1550	NO
WOODBURY	1 CROSSWAYS PARK WEST	NEW YORK	11797	516/921-0300	NO
NEW YORK	NO.1 PENNSYLVANIA PLAZA, 55TH FLOOR, 34TH. ST &	NEW YORK	10001	212/971-0800	NO
SYRACUSE	5858 EAST MOLLOY ROAD	NEW YORK	13211	315/455-2486	NO
FAIRPORT	650 PERINTON HILL OFFICE PARK	NEW YORK	14450	716/223-9950	NO
KING OF PRUSSIA	1021 8TH AVE., KING OF PRUSSIA INDUSTRIAL PARK	PENNSYLVANIA	19406	215/265-7000	NO

Total records= 12

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Hewlett-Packard Intercontinental
3495 Deer Creek Road
Palo Alto, CA 94304
(415) 856-1501

HPSA

7, rue du Bois-du-Lan
P.O. Box
CH-1217 Meyrin 2
Geneva, Switzerland
(022) 82 70 00

Hewlett-Packard

1000 N.E. Circle Blvd.
Corvallis, OR 97330
(503) 757-2000

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HP-83/85

Information Management Pac

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IMPac Program Summary

IMPac, the Information Management Pac for Hewlett-Packard's Series 80 Personal Computers, is a flexible system for creating, maintaining and accessing data files. Files created under IMPac can store alphabetic, alphanumeric and numeric data, in any combination. IMPac provides a "querying" facility called `SEARCH`, which allows you to set up *conditions*, upon which data will be located or discarded. Up to fifteen such conditions can be set for any one `SEARCH`. A set of print and display formatting functions are also available, as is a flexible `LABEL` program for printing mailing labels.

To operate properly, IMPac requires the following hardware:

- A Series 80 Personal Computer
- 82903A 16K RAM Memory Expansion Module
- 82937A HP-IB Interface
- 82936A ROM Drawer
- 15001 Mass Storage ROM
- 829XX Master 5¼" Flexible Disc Drive OR 9895A 8" Flexible Disc Drive

An external impact printer is strongly suggested, especially if the HP-83 is the base computer for IMPac (this also requires the 15002 Plotter/Printer ROM).

In addition, dual disc drives (a dual master, or a single master and single slave), are either suggested (with the HP-85) or *required* (with the HP-83), in order to maximize the amount of disc space available for IMPac data storage and to minimize execution time. In the case of the HP-83, *two* disc drives are necessary to allow data backup.

The following are the primary features and functions of IMPac:

- The *master file*, which holds the data records for each IMPac database, can be from 1 to 10,000 records long.
- Each record can be from 20 to 1,024 bytes long (record length is determined interactively).
- IMPac master file records are broken into *elements*; each element holds one item, such as a name, a state, a zip code, etc. From 1 to 99 such elements can be defined.
- Elements can be defined as *Alphanumeric*, *Numeric-only* and *Dollars*. Numeric-only and Dollars elements are "enforced;" alphabetic and "special" characters cannot be entered into them.
- Definition of all of the above is done interactively, via IMPac's `CREATE` program. Via `CREATE`, new elements can also be added to an existing master file, and existing elements can be renamed.

- IMPac's `UPDATE` program allows you to Add new records to a master file, Modify the values of elements in existing records, or Delete entire records of a master file.
- IMPac's `SEARCH` program allows you to set from 0 to 15 Conditions that are used in locating records (e.g., only those records with Account Numbers greater than 50, with zip codes starting with 606, and account balances greater than \$50.00 could be chosen).
- `SEARCH` allows you to define a virtually unlimited set of formats for printing or displaying chosen elements from each record selected with Conditions.
- `SEARCH` allows you to `SORT` the above outputs in the order of any element, and to print mailing labels with `LABEL`.
- File sizes and record sizes can be changed after creation with IMPac's `EXTEND` program.
- Line, curve, bar and pie charts can be created with the `PLOT` print option and plotting programs `IMLINE`, `IMCURV`, `IMBAR` and `IMPIE`.
- A detailed source of information about IMPac can be accessed with the `HELPER` program.

IMPac is *not* a full data base management system, but it offers many of the features of DBMS, including extensive querying and report formatting facilities. Further, IMPac uses the Series 80 standard file and record formats, so it is not difficult to write your own programs to access IMPac master files.

IMPac First-Time Usage Instructions

Files and Devices Needed

When you purchased the IMPac system, you received the IMPac programs on a 5¼" disc. This is the IMPac Program package, and is required whenever running the IMPac system. In addition, you must create an IMPac Data disc, which will hold your master, gate and header files. IMPac data files *must* be kept on disc; IMPac programs can be either on tape or disc.

If you have a Series 80 computer with a single disc drive, place the Program disc in the drive and insure that the disc drive is the default mass storage device. If you have two or more disc drives, place the Program disc in drive 0 and an initialized disc in drive 1, which will become the Data disc.

If you are using an HP-85 with a single disc drive, you must copy the Program disc to a tape cartridge; the cartridge will then become the Program medium. To do so, insure that an erased tape cartridge is in the HP-85's drive, and then type:

```
COPY ".FMS" TO ":T" (END LINE)
```

A file called "AUX" must reside on the same medium that the Data resides upon. This file can be found on the Program disc, and can be copied to the Data disc. It can also be created on the Data disc with the following command:

```
CREATE "AUX:Dnnn", 32, 1024 (END LINE) where ":Dnnn" is the Mass Storage  
Specifier of the Data disc device, 32 is the number of "blocks" to be allocated, and 1024 bytes are to  
be allocated per block.
```

IMPac uses a file called "Fnames" on the Program medium to hold the volume label and file name of the current master file, as well as the mass storage unit specifier (MSUS) of the Program medium. The initialization of the Program disc file is as follows:

```
.FMS  
DUMMY  
:D700
```

Two "dummy" files, which are needed to operate the CREATE program, are stored on the Program medium. These files are DUMMY and HDUMMY. Once you create your first Master File, you can delete DUMMY and HDUMMY. "Fnames" will be revised automatically to reflect the name of your new master file.

As you can see from above, if you are using the Program disc, IMPac assumes that the MSUS of the first disc drive is :D700 (The D could be any letter other than T, but the 700 refers to the full address). If the MSUS of the disc drive in which the Program disc is being used is *not* 700, you must correct "Fnames" by entering the proper MSUS. This is done as follows (and we are assuming that the disc drive is the default mass storage device):

```
ASSIGN#1 TO "Fnames" END LINE
PRINT#1,1; ".FMS", "DUMMY", ":Dnnnn" END LINE (where nnnn is the MSUS
number of the disc drive)
ASSIGN#1 TO * END LINE.
```

If you are using a tape cartridge as the Program medium, you should use the following command string instead of the one shown above:

```
ASSIGN#1 TO "Fnames:T" END LINE
PRINT#1,1; ":T", "DUMMY", ":T" END LINE
ASSIGN#1 TO * END LINE.
```

IMPac will now be able to properly access the "dummy" data files.

Running IMPac For the First Time

Insure that the Program medium is in the default mass storage device, and then type:

```
LOAD "FINDIT" END LINE
RUN.
```

The IMPac Program "menu" will be displayed. Press k1, the "soft key" corresponding to CREATE. The message Working will be displayed, and then CREATE will run. You will be asked Is the Master File Initialized?. Type NO **END LINE**. You will then be asked for the name of the new master file you wish to create. Enter the file name as follows:

```
Filename.Volume Label (where Filename is the name you desire for the new master file,
and Volume Label is the volume label of the Data disc).
```

CREATE should then proceed normally.

Suggestions For Using IMPac

Disc Interleave Factors The IMPac Program disc you received from the factory was initialized with an *interleave factor* of 6. This interleave factor is the best compromise between minimizing program loading and data access times, and increases disc access speeds in general by 30 to 50% over the default interleave factor. Whenever you make a backup or new copy of the Program or Data disc, first Initialize the new medium as follows:

```
INITIALIZE "new volume label", "old volume label or MSUS", 8, 6 (END LINE)
```

(where 8 is the number of blocks to allocate for the file directory, and 6 is the interleave factor.)

Medium Backup The life of a flexible disc is dependent upon the usage that it gets; the more that a disc is used, the faster it wears out. Thus, it is important to copy both the Program and Data mediums onto new discs and/or tapes on a regular basis, before medium wear can cause data to be lost.

Another reason to regularly "backup" your Program and Data mediums is that it is very easy to accidentally destroy part or all of the programs or data. Initialization of the wrong disc, performing an ERASETAPE on the Program tape, purging the wrong file, storing a program, and mechanical faults in the storage devices are among the events that can partially or fully destroy files. These problems are another reason why your discs and/or tapes should be "backed-up" on a regular basis.

It is virtually impossible to perform a "backup" with the HP-83 and a single disc drive, because there is no device to copy to. Programs can be loaded into the 83's memory one by one, and copied to a new disc in this fashion. Data cannot be so loaded, however. Backup of the Data disc (which will receive considerably more wear than the Program medium) is thus impossible. It is for this reason, along with the size of the IMPac programs which limits free space on a single disc, that we do not recommend use of IMPac on a HP-83 with a single disc drive.

Hewlett-Packard recommends that floppy discs be replaced after 50 hours of use. This guideline should be used in your scheduling of disc backups.

Notes



Section 3

IMPac Program Menu Description

The following is a description of all the IMPac Menu keys (displayed from program FINDIT):

```
Current mass storage name:IMP
Current data file name:TEST

Select option:

-----
NEW-FILE      EXTEND  DONE
CREATE  UPDATE  SEARCH  HELP
```

- (k1) CREATE:** Starts the CREATE program; used for creating a new Master File, or changing some of the attributes of an existing Master file.
- (k2) UPDATE:** Starts the UPDATE program; used for ADDing, MODIFYing and DELETE-ing records in an existing Master File.
- (k3) SEARCH:** Starts the SEARCH program; used for locating and printing records in an existing Master File. (PLOT and LABEL programs are run via SEARCH.)
- (k4) HELP:** Starts the HELPER program; used for obtaining instructions and information concerning the use of other IMPac Programs.
- (k5) NEW-FILE:** Tells IMPac to start processing a different Master File.
- (k6):** Not used by IMPac.
- (k7) EXTEND:** Starts the EXTEND Program; used to change the number and/or size of records in a Master File.
- (k8) DONE:** Stops the IMPac programs, and “clears” the current Master file name.

Notes

IMPac Command Summary

Introduction

The IMPac system provides a powerful array of commands. These commands extend the existing power of the IMPac programs by allowing the user to do such things as determine the contents of a record, determine element names, abort any IMPac program, move from program to program, change the ordered element and recover from an entry error. These commands are either available in *all* IMPac programs (independent commands), or only in *some* IMPac programs (program-dependent commands). This section of the IMPac manual will discuss all of the available IMPac commands, including what they do and where they can be used.

Command Syntax

Every IMPac command follows the following syntax rule:

- The first two characters are *always* slashes (//).
- The next two characters of the command name are required (i.e. HE for HELP, EL for ELEMENTS).
- The remaining characters of the command name can be used, but are not necessary.

Thus, following this rule, these commands are *legal*:

```
//HE //HELP //EL //ELEMENT //DU //DUM //DUMP.
```

The following commands are *illegal*:

```
HELP (No slashes preceding the word)
//H (The first two characters of the name are needed)
//EE (There is no command name that starts with EE).
```

Independent Commands

The first class of IMPac commands is the command set that works for all IMPac programs. These commands work the same way, no matter which program they are used in. They are as follows:

```
//STOP: Stop the IMPac program at this point, and return to the "menu."
//ELEMENT: Display and/or print the element names of the present master file.
```

`//ERROR`: Stop data entry at this point and return to the first available place to restart data entry. Some or all data entered to this point will be lost.

`//HELP`: Request additional information or instructions.

//STOP

`//STOP` acts as an “orderly abort” command. In order to “leave” most IMPac programs and reenter the program “menu,” it is necessary to use the `//STOP` command. Whenever a `//STOP` is entered at the keyboard, the IMPac program presently being used immediately “chains” the “FINDIT” program that provides the program menu. Any files that are open at the time of the `//STOP` are closed by the system. Under normal operating conditions, it is impossible to use `//STOP` in such a way that data files used by IMPac are corrupted. It is for this reason, therefore, that use of `//STOP` is *always* preferable to trying to abort an IMPac program by shutting the System 80 computer off. If the computer is turned off and turned back on while an IMPac file routine is in process, it is almost certain that the files will be corrupted.

//HELP

When running IMPac, you may run into problems that you do not know how to handle. You may forget the correct responses to a query from an IMPac program, or you may not know which one of several steps to take. IMPac allows you to request additional operational information via the `//HELP` command. `//HELP` is a legal response to any question or query from any IMPac program.

Please remember that the IMPac manual should be your primary source of information. In order to control the length of the IMPac programs, the `//HELP` responses have been kept terse; therefore, you may not get as much help as you need from the `//HELP` command.

//ELEMENT

When running IMPac, it is often important to know what elements are used by the present master file. For example, if you want to do a `SEARCH` of the master file for certain records, you must know the names and/or numbers of the elements, in order to specify the `SEARCH` conditions. Similarly, you need to know the available elements in order to use the `MODIFY` function of `UPDATE`. Further, you are required to state these conditions or selections by element order (element 2 must come before element 3, or an error message will be given; this is a rule used by all IMPac programs, except when using Print Options in `SEARCH`).

In order to determine all the elements available in their proper order, type `//ELEMENT` as the answer to any question or query from an IMPac program. Every available element will be printed, preceded by its element number. After the list has been exhausted, the question or query to which you replied `//ELEMENT` will then be repeated.

//ERROR

If you make a mistake while entering data (for example, you enter the wrong condition for a `SEARCH`, enter an incorrect element name or number in setting up a "SPECIAL" print format, or a similar error), you do not have to abort the IMPac program with `//STOP` or continue and get outputs that you do not want. The `//ERROR` command will allow you to recover from an entry error.

To use this command, type `//ERROR` as the response to any question or prompt from an IMPac program. IMPac will go back to a "suitable" starting place (usually, the place where data entry began before the error occurred). Data entered prior to the `//ERROR` command is lost, again back to the point where data entry began.

The second major class of commands are *program-dependent* commands. These are commands that are used in one or more IMPac programs. Unlike the independent commands (which do precisely the same thing in all IMPac programs), program-dependent commands can have different functions in different IMPac programs, although they *may* have the same name.

It is first important to note that IMPac will give an error message if one of the programs cannot recognize a command. Therefore, you do not have to worry about "damage" from using an illegal command in one of the programs.

//ADD: Used in UPDATE

The `UPDATE` program offers three functions: `ADD`, `MODIFY` and `DELETE`. If the `MODIFY` or `DELETE` functions are being used, the `ADD` function can be started without using `//STOP` and reselecting `UPDATE` by entering `//ADD` as the response to any question or prompt. The function being used at the time will be ended, and the `ADD` function will immediately begin with the question `Do you want Automatic ID Assignment?`.

//ALL: Used in SEARCH

When printing out all the records that meet the conditions set by the user in `SEARCH`, it is often desirable to print the entire contents of the records. One way of doing this is, when asked for the elements to be printed, is to reply with every element number (1, 2, 3 ... n) or name (ID, ABC, ..., XXX). This method is both time-consuming and error-prone, because it is very easy to leave out one or more elements, or to lose track of the elements already entered (this is especially true of master files with twenty or more elements).

The preferred way of printing every element is to use the `//ALL` command when asked for the elements to print. When `//ALL` is used, every element will be included and thus, no chance for error or omission exists.

//DELETE: Used in UPDATE

There are three functions available in `UPDATE`: `ADD`, `DELETE` and `MODIFY`. When using the `ADD` or `MODIFY` functions of `UPDATE`, the user may find a need to delete a record. (One case where this is true is when you attempt to `MODIFY` the value of the Ordered Element in a record. Since this would require resequencing the entire file, you are not allowed to do this directly. You must first `DELETE` the record with the erroneous Ordered Element and then `ADD` the corrected record back to the master file.) In order to use the `DELETE` function without using `//STOP` and then going back to `UPDATE` through the "menu," type `//DELETE` as the response to any question or query. The present function will be ended, and the `DELETE` function will begin immediately.

//DUMP: Used in CREATE and UPDATE

During the course of using IMPac, you may wish to see the entire contents of a record without having to `//STOP` the present program and use `SEARCH`. (For example, you may want to examine the entire contents of a record before `MODIFY`ing or `DELETE`-ing it, in order to make sure you are changing or removing the proper record.) You can "dump" the entire contents of any record, displayed as it is stored in the master file, by entering the command `//DUMP` after you have entered the ID number of the record.

Also, `//DUMP` can be used to display all the 'DO' Formats that have been written into the Header file (used in `CREATE`, with `//FORMAT`).

//FORMAT: Used in SEARCH and CREATE

One of the most useful features of IMPac is the ability to store frequently used `SEARCH` conditions in mass storage. This feature, which is called 'DO' formatting, can be a major time-saver when you `SEARCH` on the same conditions over and over. For example, a cardiologist may use IMPac to create and maintain a cardiological database for research. As part of this research, the doctor may need to regularly find all black male patients with a blood pressure above 135/80 (classic hypertension), ST-T wave abnormalities and a history of bradycardia. Let's assume that each of these items (race, sex, blood pressure, ECG wave abnormalities and heart rate) is assigned to a separate element. If the doctor needed to enter these conditions every time a `SEARCH` was done, five conditions would have to be entered in the correct order every time. With a 'DO' format, the doctor needs to define the conditions only *once*. From this time on, a `SEARCH` can be done on these conditions merely by entering `DO-n`, where `n` is the number of the format.

In order to store and examine these 'DO' formats, the `//FORMAT` command is used. When the `//FORMAT` command is entered in response to a question or prompt from `SEARCH`, you will be informed that the `SEARCH` program will be terminated, and the `CREATE` program begun. You must then re-enter the `//FORMAT` command; you will then be asked for the number of the 'DO' format you wish to create. At this time, you can either enter a positive number from 1 to 20, or you can enter `//DUMP` to examine all existing 'DO' formats.

If you decide to enter a new 'DO' format, you should follow these guidelines:

- Use element *numbers* instead of element *names* whenever possible, to save space.
- When you have completed entering the SEARCH conditions, if you desire to also define the print format, enter the following:

`END LINE`

Name of Print Option (i.e. REPORT, LIST, SPECIAL)

Elements to be printed

`END LINE`.

The 'DO' format should now be stored under the assigned format number. This format can be used instead of selection of individual conditions by answering the SEARCH Conditions query from SEARCH with `DO-n` `END LINE`, where n is the number of the proper format. An error will occur if no format with this number can be found.

//MODIFY: Used in UPDATE

The UPDATE program of IMPac has three functions: ADD, MODIFY and DELETE. While either the ADD or DELETE functions are in use, you can immediately go into the MODIFY function without having to `//STOP` the program by giving the `//MODIFY` command. `//MODIFY` will be accepted as the answer to any question or prompt in UPDATE, and will immediately stop whatever function is in progress and start MODIFY.

//NO PROMPT: Used in UPDATE

When using the ADD function of UPDATE, you will notice that you are "prompted" for the value of each element by a display of the element names. If you have many records to ADD, and are familiar with the element names, you can suppress display of the element names by issuing the `//NO PROMPT` command as a reply to an ADD request for an element value. UPDATE will return with the following message: Enter the value for (next element name) and continue. From this point on, you will be prompted solely by question marks. (This command can be reversed with `//PROMPT`.)

//PROMPT: Used in UPDATE

If you have executed a `//NO PROMPT` command in the ADD function of UPDATE, you can revoke the command with a response of `//PROMPT` to any request for an element value. Starting with the next element, you will see each element name displayed, along with the prompting mark. (Note that, if a `//NO PROMPT` command has not been executed, `//PROMPT` will cause no effect.)

//RESEQUENCE: Used in UPDATE

It is possible that, after some experience with using your master file, you may decide that the present Ordered Element (the element upon which the order of the master file is kept) is not the best one for the purpose (for example, you are doing frequent searches on an element other than the present Ordered Element). Therefore, in order to speed up searches of the master file, it would be desirable to assign a new Ordered Element. This can be done via the `//RESEQUENCE` command.

If you respond to any prompt or question in `UPDATE` with `//RESEQUENCE`, you will be asked for the number or name of the new Ordered Element. The following rules must be followed:

- The element to be converted into the Ordered Element must already exist.
- The element to be converted must be either the third, fourth, fifth or sixth element of the master file.
- No action will be taken if the element selected is already the Ordered Element.

If these rules are followed, the master file can be resequenced to conform to the order of the new Ordered Element. This process requires that a file with the record numbers of the master file, called "SORT," be created. If there is sufficient room on either the program or data mass storage devices, this is done automatically. If insufficient room exists, you will be notified by an error message, and some files on either disc will have to be purged.

The `//RESEQUENCE` process takes a long time to complete. Status messages will be given to you as portions of the process are completed. If you abort the process by shutting off the power to either the computer or the disc drive, the master and header files *may be corrupted*. It is thus strongly suggested that you allow the process to complete by itself.

//SEARCH: Used in UPDATE

While you are using one of the `UPDATE` functions, it is possible that you may wish to use the `SEARCH` program. The first way to do this is to issue a `//STOP` command, and then select `SEARCH` from the program "menu." A better way to accomplish the same thing, however, is to issue the `//SEARCH` command as a response to any question or query from the `UPDATE` program. When this is done, `UPDATE` will immediately stop, and the `SEARCH` program will begin running with no need to return to the "menu."

//UPDATE: Used in SEARCH

While you are using `SEARCH`, you may desire to make some change to the master file (an `ADD`, `MODIFY` or `DELETE`). To do so, you need the `UPDATE` program. You could get `UPDATE` by `//STOP`ping `SEARCH`, and then selecting `UPDATE` from the program "menu." An easier and faster way, however, is to issue an `//UPDATE` command as the response to any question or prompt from `SEARCH`. If this is done, `SEARCH` will stop immediately, and the `UPDATE` program will begin running.

Operating Instructions

Introduction

This manual will describe the operation, usage and requirements of the Information Management Pac (referred to as IMPac). When thoughtfully used, IMPac can be a powerful system for the creation, modification and search of data files. These data files can be collections of related information about a wide variety of subjects. For example, an account list for a wholesaler or a consulting engineer can be maintained as easily as a list of the processing attributes of various plastics. The user in both cases need not know anything about the internal operation of IMPac (although, as we will see, IMPac can be made more efficient with usage of knowledge about its operation).

IMPac has been designed for use on Hewlett-Packard Series 80 Computers with the following: An 82903A 16K RAM Memory Expansion Module, an 82937A HP-IB Interface, an 82936A ROM Drawer and 15001 Mass Storage ROM, and a 829XX or 9895A Flexible Disc Drive. A hardcopy printer is not required, but is recommended to take full advantage of the report capabilities of the IMPac system.

Things You Should Know

- The `//STOP` command will stop whatever IMPac program you are using and return you to the program "menu." Whenever you wish to end a program, use `//STOP`.
- If you interrupt the `CREATE` or `UPDATE` programs by pressing `(PAUSE)`, you may corrupt your data base by pressing `(RUN)`. Always allow `CREATE` and `UPDATE` to complete their processing by pressing `(CONT)` instead of `(RUN)`.
- You can usually recover from errors in data entry with use of the `//ERROR` command.

Getting Started With IMPac

Assuming that both the computer and the disc drive are "powered-up," first insure that the device that the IMPac programs reside on is the default mass storage device; if it is not, please make it so. After this has been accomplished, press `(LOAD) "FINDIT" (ENDLINE) (RUN)`. IMPac will start, as initialized from the factory, with File Name "DUMMY" and Volume Name ".FMS". "DUMMY" is a blank file residing upon the program disc; ".FMS" is the volume label of the program disc. As you progress in IMPac, you will be creating a new "master" file (a master file is a file that holds information entered through IMPac). After you have created this file, there is no further need for "DUMMY," so you will be able to delete "DUMMY" and "HDUMMY" from the master disc or tape.

Creating an IMPac Master File

Before the process of creating a master file is explained, some definitions are in order. A “master” file is a file that IMPac uses to store the actual data that is desired. A “header” file is a file that stores important information about the structure of each master file. A “gate” file is used for temporary storage of records being written into the master file. Every IMPac master file must have a unique header and gate file. Beyond these three files, some additional files are necessary. First, “AUX,” a 32-record “scratch” file, is necessary. Next, “AUX2,” a 50-record “scratch” file used during the UPDATE process, is needed. Finally, “DO,” a file that stores frequently-used SEARCH criteria, is needed.

IMPac expects to find the following files on the PROGRAM device (tape or disc):

AUX2 (50 records, 1024 bytes each)

DO (2 records, 512 bytes each)

IMPac also expects to find the following files on the DATA device (disc only):

AUX (32 records, 1024 bytes each)

“MASTER” (User-named, 1 to 10,000 records, 20 to 1024 bytes each)

“HEADER” (Named by the CREATE program, n records, 512 bytes each)

“GATE” (Named by the CREATE program, 4 records, 20 to 1024 bytes each)

Let’s now set up an example, which will be used throughout this manual. Hewlett-Packard needs to keep a small database, with U.S. office cities, addresses, telephone numbers, product and service classes. HP plans ~~to~~^{to} use this database to keep track of sales office information, as well as to categorize offices by products and functions. Given this, we should first define the information we need to fulfill the jobs laid out for the database. We need:

Sales Region Names

Addresses (box number, street, city, state and zip code)

Telephone numbers

Products handled

A classification (sales and service office, or strictly a sales office)

We now know *what* information we need. We are planning to use IMPac to gather and control this information, so what additional constraints must we consider? First, we must have a minimum of three and a maximum of 99 elements in each record. Next, we must select an Ordered Element (the element the master file will be ordered upon) that is from the third to the sixth element. We should, therefore, select those pieces of information that will be most important in accessing the database and place them at the front of each record, with the Ordered Element preferably in the third position.

Now, let's match our requirements with those of IMPac. From the previous list, we know that we need to create at least *six* elements, so we can fulfill IMPac's requirements on this account. Next, we need an Ordered Element. With all of our previously-stated items available, what would make the most sense? It would make sense to make either State or City the Ordered Element, because both define either a small group of offices (State) or one office (City).

There could be two cities with the same name (Kansas City, Kansas and Kansas City, Missouri, or Pittsburgh, Pennsylvania and Pittsburgh, California, as examples). There will be more than one office in a state (New York and California have several). Thus, neither State nor City necessarily define any one office uniquely. However, IMPac will print outputs in the order of the Ordered Element. It makes more sense to get these outputs in alphabetical order by State than it does to get them in order by City. Therefore, State becomes the Ordered Element, and reports will be printed in the alphabetical order of the States.

We also know that IMPac requires you to assign an ID number to every record (this can be done by the system itself), and that the ID must be the first element in each record. Therefore, you must make allowance for ID numbers when the master file is created.

Now, we are ready to define our master file. To do so, **LOAD** "FINDIT" **ENDLINE** **RUN** will start the "menu" program. Press the soft-key that refers to **CREATE**. The message Working will be displayed, and then you will be asked Is the Master File Initialized?. Answer **N** or **NO**. You will then be asked for the new file name. This name must include a volume label, so you might enter **SALES.IMP**, where **SALES** is the file name and **IMP** is the volume label. **CREATE** will then check your file name for validity; if it passes this test, a temporary file called "ELEMENT" will be created.

```
Current mass storage name:FMS
Current data file name:DUMMY

Select option:

-----
NEW-FILE      EXTEND  DONE
CREATE  UPDATE  SEARCH  HELP
```

```

Current mass storage name:FMS
Current data file name:DUMMY

Is the master file initialized?
NO

```

```

New file name:?
SALES.IMP
Input maximum expected number
of records:?
150

```

You will then be asked for the number of records that you wish the new master file to contain. This number should be high enough to allow for entry of enough records to meet your storage needs, but should not be much larger than you envision a need for, in order to conserve disc space. (If you run out of room, the EXTEND program will allow you to increase the size of the master file.)

In this example, we will set the number of records to be allocated at 150. If you had pressed **END LINE** without entering a number, IMPac would have defaulted to 100 records, and you would have seen the following line displayed:

```
DEFAULT FILE SIZE = 100 RECORDS
```

After the prompt for the number of records, CREATE will ask you for the name of the *second* element (remember that IMPac always names the first element ID, and that this name cannot be changed). A good rule of thumb for selecting element names is to select a *short* name (thus saving storage space), but that communicates what the element contains and can be remembered. Using our example, we will name the second element "REGION," for Sales Region that the office is in.

Next, you will be asked Will this element be Alphanumeric, Numeric-only or Dollars?. An Alphanumeric element cannot be Tallied (a function of SEARCH), while no characters other than 0 through 9, +, -, and . are legal in a Numeric-only or Dollars element. Since the Region is a name, we enter A or Alphanumeric.

You will then be asked for the maximum length of the element. IMPac will not hold you to this length in data entry, but will use this figure in calculating the overall size of each record. In this example, there are four Sales Regions (Eastern, Southern, Midwest and Neely). The longest name is Southern, with eight characters, so we answer 8.

```

Enter name for element # 2 ?
REGION
Will this element be
Alphanumeric, Numeric-only
or Dollars ($) ?
A
Maximum size in characters: ?
8

```

If you had pressed **END LINE** without entering any value for element length, a default element length of 20 characters (bytes) would have been set, and the following message would have been displayed:

```

DEFAULT ELEMENT LENGTH=
TWENTY BYTES

```

CREATE next asks for the name of the third element; we will use the State Name, and call the element **STATE**. We define **STATE** to be Alphanumeric, and set the maximum length of **STATE** to 20 characters.

We then define the remaining elements as follows:

4:	CITY	Alphanumeric	25 characters
5:	BOX	Alphanumeric	20 characters
6:	STREET	Alphanumeric	30 characters
7:	ZIP	Numeric-only	5 characters
8:	PHONE	Alphanumeric	12 characters
9:	PRODUCTS	Alphanumeric	20 characters
10:	SERVICE	Alphanumeric	3 characters

We tell IMPac that we have finished naming elements by entering an **END LINE** as the response to the request for the eleventh element name. **CREATE** then asks:

```
Which Element Number:
3: STATE
4: CITY
5: BOX
6: STREET
Is the Ordered Element?
```

As you recall, we decided that the State should be the Ordered Element, so we enter 3. Once this has been done, **CREATE** will create and initialize the following files:

1. **SALES**, the *master* file
2. **HSALES**, the *header* file containing information about **TEST**
3. **GSALES**, the *gate* file used for temporary storage of **TEST** data

```
Files created

File          # of recs   Rec Size
SALES.        151         213
HSALES        19          512
GSALES        4           213
```

```

Current mass storage name:IMP
Current data file name:SALES

Select option:

-----
NEW-FILE      EXTEND  DONE
CREATE  UPDATE SEARCH  HELP

```

Note that, if we had initially given the master file another name, such as `FILE1`, these files would have been created: `FILE1`, `HFILE1` and `GFILE1`. The header file always starts with `H` and ends with the first five letters of the name of the master file, while the gate file starts with `G` and ends with the same letters from the master file name. It is suggested that, although file names of up to ten characters are legal on discs, you use names of no more than six characters to insure compatibility with tape file names (in the case of the HP-85 only).

Once the files are initially created on the disc, `CREATE` will tell you the names of the three files, along with their lengths and record sizes. `CREATE` will then initialize the header file, which takes about 15 seconds. Finally, `CREATE` will end and you will be returned to the program "menu." At this point, you can select `UPDATE` and begin adding records to your new master file.

Other Functions of CREATE

In addition to the primary purpose of `CREATE`, which is to define, create and initialize IMPac master files, there are three additional functions that `CREATE` can perform. These are as follows:

- 1-RENAME ELEMENTS
- 2-ADD ELEMENT
- 3-DELETE 'DO' FORMATS

These functions can be accessed by answering the question `Is the master file initialized?` with a `Y` or `YES` instead of `N` or `NO`. The screen will then display the above selection of functions. You must use at least the first two letters of the function to be used (`AD` for `ADD ELEMENT`, `RE` for `RENAME ELEMENTS`, or `DE` for `DELETE 'DO' FORMATS`), OR the *number* displayed in front of each operation (see above).

```

Current mass storage name:IMP
Current data file name:SALES

Is the master file initialized?
YES

```

Renaming an Element

The first function available is that of changing the name of an existing element. If you select this function, you will be asked for the element's name or number, and then the new name. You cannot duplicate an existing element name, and there must be sufficient space in the header file for the new name. If both of these conditions are met, the element will be renamed in the header file. You will also be asked to redefine the element as Alphanumeric, Numeric-Only or Dollars. This will be no problem if you change the existing element from Numeric or Dollars to Alpha, or in converting from Numeric to Dollars and vice versa. You should *not* change an Alpha element into Numeric-only or Dollars if you have put any characters other than 0 through 9, +, - or . into any element value. If you do, and then attempt to TALLY this element, a fatal error will occur. Thus, you must exercise caution when renaming elements.

```

Operations:1-RENAME ELEMENTS
           2-ADD ELEMENT
           3-DELETE 'DO' FORMATS

OPERATION?
1

Current name?
NEWNAME
New name?
OLDNAME
Will this element be
Alphanumeric, Numeric-only
or Dollars ($) ?
A

Current name?

```

```

Operations: 1-RENAME ELEMENTS
            2-ADD ELEMENT
            3-DELETE 'DO' FORMATS

OPERATION?

```

Adding an Element

The second function, Adding an element, does exactly what the name implies; it allows you to name and add an additional element to the Master file. There are several limitations on this function, however. First, you can only add elements at the end of the existing set (you cannot insert elements into a list). Second, you cannot use the name of an existing element as the name (or part of the name) of a new element. Finally, there must be sufficient room in both the Header file (where element names are stored) and in each Master file record (where element values are stored) for the new element, or an error will again result.

If all of the above conditions are fulfilled, the new element will be created and appended to the master file. In our example of SALES the first new element would be Element #11. If you add a new element to a master file in which some records have already been written, CREATE will allocate space in every written record for the new element or elements with a dash (-). As with any element, you will be asked for the value of the new elements whenever an ADD is done in UPDATE, and you can change the dashes to their correct value in previous records with the MODIFY function of UPDATE.

```

OPERATION?
2

Input names of the new elements:
ELEMENT NO.  11 ?
NEWNAME
Will this element be
Alphanumeric, Numeric-only
or Dollars ($) ?
A
ELEMENT NO.  12 ?

```

Deleting 'DO' Formats

The use of 'DO' formats to speed the SEARCH process has been discussed previously (see //FORMAT under Program-Dependent Commands and SEARCH). At some point in the use of your master files, you may find that the 'DO' formats that were previously defined are no longer needed. These formats can be replaced one-at-a-time by entering new 'DO' formats and assigning them the numbers of presently defined formats. If you are running out of space in the 'DO' file, however, you may be unable to assign a new 'DO' format. In order to free the entire 'DO' file for new entries, you can use CREATE to Delete all 'DO' Formats.

When you select this function, you will be asked only one question: Delete all 'DO' formats (Yes/No)? If you answer with Y or YES, the message All 'DO' Formats are Deleted will be displayed. If you answer with N, NO or anything else that does not start with a "Y," no 'DO' formats will be deleted.

```

Operations:1-RENAME ELEMENTS
           2-ADD ELEMENT
           3-DELETE 'DO' FORMATS

OPERATION?
3

Delete all 'DO' formats (Yes/No)
?
YES

All 'DO' formats are deleted

```



Changing the Contents of a Master File With UPDATE

The UPDATE program of IMPac can be started in two ways: First, UPDATE can be selected from the program "menu," and second, the //UPDATE command can be issued from SEARCH or CREATE to begin UPDATE. There are three functions of UPDATE: ADD, DELETE and MODIFY. The ADD function allows you to add records to the master file. The MODIFY function allows you to change the values of one or more elements in one or more records of the master file. DELETE allows you to remove one or more records from the master file.

ADD: Adding Records

The ADD function can be started either by entering A or ADD when asked for an Operation?, or by giving an //ADD command while using MODIFY or DELETE. The first question from the ADD function is:

```
Do you want Automatic
ID Assignment?
```

If you answer Y or YES, UPDATE will locate the largest ID number presently in the master file, add one to it, and make it the new current ID number. If you answer N or NO, you will be prompted to enter an ID number for every record. It is suggested that you use the Automatic ID Assignment, for the following reasons:

- If you enter your own ID numbers, IMPac must search the master file every time a new record is entered to insure that the new ID number does not duplicate an existing ID number.
- Due to this searching, ADD will not allow you to continue to enter element values until it confirms that no ID duplication exists, which slows down the record entry process.

For these reasons, you should use Automatic ID Assignment whenever possible. If you do so, the value of the ID and the Ordered Element will be printed (HP-85 or HP-83 with a hard-copy printer) or displayed (HP-83 with no printer). This allows you to keep a record of the ID numbers assigned, cross-referenced to the values of the Ordered Element.

After you have made this decision, you will either be asked for the value of the ID or the second element (Manual IDs in the first case, Auto in the second). Enter the proper value. IMPac will then determine what kind of element this is (Alphanumeric, Numeric-only or Dollars), and depending on the element type, will check to insure that your entry is correct (i.e., no letters or special characters in a Numeric-only or Dollars element). If the entry is acceptable within the element type, you will be prompted for the value of the next element with the next element name. This process will continue until every element in the record has been assigned a value, at which point you will either be asked for the next ID, or the next ID will be given to you by ADD.

After a record has been added to the master file, the following message will be displayed:

```
nn RECORDS REMAINING: MASTER
qq RECORDS REMAINING: TEMP
```

These "status lines" tell you how many records, in total, remain empty in the master file (first line), and how many of the 50 records in the temporary storage file still remain empty.

```
Current mass storage name:IMP  
Current data file name:SALES
```

```
Select option:
```

```
-----  
NEW-FILE      EXTEND  DONE  
CREATE  UPDATE SEARCH  HELP
```

```
Current mass storage name:IMP  
Current data file name:SALES
```

```
Records written=0  
Records available=150
```

```
Select operation: ADD  
                  MODIFY  
                  DELETE
```

```
Operation?  
ADD
```


DO YOU WANT AUTOMATIC
ID ASSIGNMENT?

Y

REGION:?

SOUTHERN

STATE:?

ALABAMA

CITY:?

HUNTSVILLE

BOX:?

P.O. BOX 4207

STREET:?

8290 WHITEBURG DR.

ZIP:?

35802

PHONE:?

STATE: ARIZONA

ID:3

205/999-9999

PRODUCTS:?

ALL

SERVICE:?

NO

OLDNAME:?

NONE

149 RECORDS REMAINING: MASTER

49 RECORDS REMAINING: TEMP

REGION:?

NEELY

STATE:?

ARIZONA

CITY:?

PHOENIX

BOX:?

-

STREET:?

2336 E. MAGNOLIA

ZIP:?

85034

PHONE:?

602/244-1361

PRODUCTS:?

ALL

SERVICE:?

NO

OLDNAME:?

NONE

148 RECORDS REMAINING: MASTER

48 RECORDS REMAINING: TEMP

REGION:?

The process, as explained above, can be repeated up to 50 times. If you try to enter more than 50 records at a time, a message will be displayed that the Temporary File is Full. Please allow ADD to put these records into the master file before continuing. When you have added as many records as you need, you must inform ADD that you are done by pressing **END LINE** when asked for either the next ID number or value of the second element.

After you have pressed **END LINE**, you will be asked DO YOU WISH TO EDIT TEMPORARY FILE?. If you enter Y or YES, you can then change any entries that have been made in this ADD session. If you enter N or NO, ADD will begin transferring the records you have entered from the temporary file to the master file.

Assuming that a Y or YES has been entered, you will next be asked EDIT SAME ELEMENTS IN EACH RECORD?. If you answer Y or YES, you will be prompted to change the same elements in each record you edit. If you answer N or NO, you will have to provide a separate element list for each record you edit. On a reply of Y or YES, you will be asked ELEMENTS?. Enter the elements you plan to change, one at a time. If a N or NO answer is given, you will *first* be asked for the ID number of the record to edit, followed by the elements to change in that record. The value of each element to be changed is displayed, one at a time, and you can tell ADD to change the value by entering the corrected value, or to keep the old value by pressing **END LINE**. You can get out of "edit" mode by pressing **END LINE** when asked for the ID number of the record to edit.

```
DO YOU WISH TO EDIT TEMPORARY
FILE?
Y
EDIT SAME ELEMENTS IN EACH
RECORD?
Y
ELEMENTS
?
PHONE
?

ID?
1
OLD PHONE: 205/999-9999
NEW PHONE: ?
205/881-4592
ID?

NO OF RECORDS WRITTEN = 1
NO OF RECORDS WRITTEN = 2
```

“Standard Formats” for Entering Values: The mechanism that IMPac uses for handling comparisons between the values of elements has been briefly discussed. It is important that you understand *how* IMPac handles these values, and how IMPac ‘orders’ these values, in order to develop consistent formats for entering element values into any master file.

Every element value, whether it be for an alphanumeric, numeric-only or dollars element, is stored as an alphanumeric string, and compared as such. The first rule of alphanumeric comparisons is that the *length* of each string is critical. Thus, given the following two element values: 'XXX,' 'ABCD,' IMPac would put XXX *before* ABCD because XXX is one character smaller than ABCD. With two elements of equal length, a character-by-character comparison takes place. If the following element values were entered: JOE JONES, JONES, JOE and JONES JOE, the first value would be considered the smallest, followed by the third (a space is less than a comma), and then the second.

There are two circumstances in which IMPac modifies records to make comparisons more straightforward than usual. The first case is when more than one blank is imbedded in an element value. IMPac will delete all but the first blank in a series of blanks. Thus, JOE JONES will equal JOE JONES, which will equal JOE JONES, and so on. The second rule is that IMPac converts all letters into upper case, such that McDONALD, BILL will become MCDONALD, BILL.

The use of "Standard Formats" is advisable whenever you want to make sure that comparisons done for SEARCHes are consistent. As an example, consider the usage of dates. One of the elements defined could have the name LDATE, so we can use this field. The dates Jan 1, 1981, 01011981, 010181, and 810101 can all refer to the same date, but in IMPac, they are each *unique* dates. If we try to do a SEARCH with the value of LDATE as a condition, and we have not standardized the format in which the dates are entered, the SEARCH not give correct results. We must therefore set one standard for our entries into LDATE. In this case, what standard makes sense? We have, as one rule, that element lengths should be kept as short as possible. We also know that any date can be stored in six digits (2 for day, 2 for month, and 2 for year). Therefore, a six-digit format makes sense. Further, by putting the digits into order as year, month, day, we can do range comparisons (81mmdd is *always* larger than 80mmdd, but in ddmmmy format, 082276 is greater than 010181). Thus, we should standardize dates in *yymmdd* format.

A similar rule holds for names. Using the \wedge operator (to be discussed in SEARCH), we can search for all persons whose last NAME is SMITH, or starts with S, or falls between D and M, etc. If we put last names first, these conditions will work, and *further*, we could use NAME as the Ordered Element and get sensible results. If we entered names with first, and then last, names, we could not do SEARCHes based upon NAME conditions, nor could we use NAME as the Ordered Element and get any result nearing correct alphabetical order. Thus, names should be entered as Last Name, a comma, and then First Name.

Dollar values, too, fit within this rule. IMPac considers 100, 100.0 and 100.00 to all be different values when SEARCHing. Thus, you should always use dollars, a decimal point, and cents.

Using the Dash (-) as the Fill Character It is strongly suggested that, whenever you are using UPDATE to ADD, MODIFY or DELETE records, the *dash* (-) be used as the "fill" character whenever you do not know the value of any element. As was discussed previously about ADD, if you press **ENDLINE** with nothing typed before it as the response to a prompt for an element value, ADD will assume that you wish to end data entry. As a result, a blank *cannot* be used as the "fill" character.

Further, while TALLYing in SEARCH, the dash with no following characters is used as a “flag” to disregard this element value in this record. There is no assurance that use of another fill character will not give spurious results in a TALLY; in fact, accidental use of a plus (+) or decimal point (.) could cause a fatal error.

Entries That Exceed the Record Size: In UPDATE, an internal count of the number of characters remaining in each record is kept while entering element values. As discussed earlier, IMPac uses “dynamic allocation” to allow you to make individual element values as long or as short as necessary. In this way, you are not forced to limit an element value to the size originally specified during CREATE’s master file initialization. Since no individual element limits are kept, however, it can become possible to enter a series of element values that exceed the available record size.

If this happens, IMPac will not allow you to overwrite the next record, which could corrupt the database. Instead, you will be told that YOUR LAST ENTRY OVERFLOWS THE AVAILABLE SPACE. START OVER, ABBREVIATING WHERE POSSIBLE. You will have to enter the current record again, abbreviating wherever possible, in order to fit the record into the available space. You do *not* have to start again with the very first record of the present session.

//NO PROMPT and //PROMPT: Once you have gained some experience with an IMPac master file, you may find that you can remember all the element names, in their proper order. You may have also devised a “data entry form,” where you or someone else has made entries onto a pre-printed form in the proper order. In both these cases, it is time-consuming, redundant, or both, to have ADD prompt you for each element value with the name of every element.

In order to “turn off” these prompts, you can use the //NO PROMPT command as your response to a request for an element value. ADD will reply INPUT THE VALUE FOR element name AND CONTINUE. From this point on, you will be prompted for element values with only a question mark, ?, *not* each element name.

```

Records written=2
Records available=148

Select operation: ADD
                  MODIFY
                  DELETE

Operation?
ADD
DO YOU WANT AUTOMATIC
ID ASSIGNMENT?
Y

```

```

REGION: ?
//NO PROMPT
INPUT THE VALUE FOR REGION
AND CONTINUE
?
NEELY
 3 : ?
ARIZONA
 4 : ?
PHOENIX
 5 : ?
-
 6 : ?
2336 E. MAGNOLIA ST.
 7 : ?
85034
 8 : ?
602/244-1361
 9 : ?
ALL
10 : ?
NO
11 : ?
NONE
147 RECORDS REMAINING: MASTER
 49 RECORDS REMAINING: TEMP

```

If you should desire to have ADD use element names as the prompt for input of element values, the `//PROMPT` command can be used. If `//PROMPT` is entered as the response to any request for an element value, the element name prompts will again be used. When you end an ADD session, the `//NO PROMPT` condition will be stopped and the default (element name prompt) condition will be used the next time you ADD.

```

 2 : ?
//PROMPT
?
NEELY
STATE: ?
ARIZONA
CITY: ?

```

MODIFY: Changing the Values of Existing Records

The MODIFY function can be started either by entering `M` or `MODIFY` when asked for an Operation, or by using the `//MODIFY` command while in `ADD` or `DELETE`. Once begun, the first question from the MODIFY function is:

```
MODIFY THE SAME ELEMENTS IN EACH
RECORD?
```

If you answer Y or YES, you will next be asked for a list of element names and/or numbers. If you answer N or NO, you will next be asked for an ID number. In the YES case, you are telling MODIFY that you wish to change the values of the *same* elements in each record to be modified. As an example, if you answered Y or YES, and then entered the elements REGION and CITY, you would then be asked for an ID number, which must be the ID number of the first record to MODIFY. You will then see:

```
OLD REGION=aaaaaaaaaaaaaaaa
NEW REGION=?
```

Enter the new LDATE, and then you will see:

```
OLD CITY=aaaaaaaaaa aaaaaaaaaa
NEW CITY=?
```

Enter the new CITY, and then you will be asked for the next ID. To conclude this series of modifications, enter //STOP when asked for an ID number.

If you answer N or NO to the first question, this tells MODIFY that you wish to change different elements in each record to be affected. You would then be asked for an ID number. You should enter the ID number of the first record you wish to MODIFY. Next, you will be asked for the elements to MODIFY. Enter these names and/or numbers as you would normally. Finally, the display:

```
OLD 'element name'=value
NEW 'element name'=?
```

would appear. Answer with the corrected value, and then the display

```
OLD 'element name'=value
NEW 'element name'=?
```

would appear. This would continue until all the elements you chose had been corrected, after which you would be asked for the ID of the second record to MODIFY. As above, you end the MODIFY process by giving the //STOP command in response to a request for an ID number.

Special Considerations There are some points that must be kept in mind whenever MODIFY is used. The first consideration is that "Standard Formats" for entering element values must be followed as closely in MODIFY as they are in ADD. A name, date, dollar figure or other value that violates your format rules can be as fatal to SEARCH accuracy in MODIFY as in ADD.

The second consideration is that an element value changed in MODIFY can overrun the record size, just as in ADD. The same error statement will be given as in ADD, and you will have to enter a "condensed" version of the element value to get it to fit into the record. (To get some idea of the contents of the record, in order to gauge the remaining space, you can give the //DUMP command when asked for an element value.)

The third consideration is that the value of the Ordered Element cannot be changed with MODIFY. If you make a mistake in the Account Number of a record, for example, and do not catch it in the ADD edit phase, you cannot MODIFY it once it is written into the master file. If you attempt to do so, you will get an error message.

```
Current mass storage name:IMP
Current data file name:SALES
```

```
Records written=4
Records available=146
```

```
Select operation:  ADD
                   MODIFY
                   DELETE
```

```
Operation?
MODIFY
```

```
MODIFY THE SAME ELEMENTS IN EACH
RECORD?
```

```
Y
```

```
ELEMENTS:
```

```
?
```

```
STATE
**THE ELEMENT STATE
MAY NOT BE MODIFIED DIRECTLY.
YOU MUST FIRST DELETE THIS
RECORD AND THEN ADD IT BACK
TO THE DATABASE WITH A CORRECT
ORDERED ELEMENT.
CONSULT MANUAL FOR INSTRUCTIONS.
```

```
ELEMENTS:
```

```
?
```

If a record in the master file is no longer needed (i.e., an account is no longer active, an office has moved or closed, a product is no longer marketed), it is a good practice to DELETE this record. Deleting unneeded records frees space in the master and header files that can be used to store new records. Further, deleting unnecessary records reduces the time needed to SEARCH the master file. Finally, use ADD to reenter the record, with the correct Ordered Element.

DELETE: Deleting Records

If a record in the master file is no longer needed (i.e., an account is no longer active, a patient has moved or died, a product is no longer marketed), it is a good practice to DELETE this record. Deleting unneeded records frees space in the master and header files that can be used to store new records. Further, deleting unnecessary records reduces the time needed to SEARCH the master file.

For these reasons, it is to your advantage to regularly review your IMPac master files and DELETE those records that are no longer needed. The DELETE function can be started either by entering D or DELETE when asked for an Operation?, or by giving the //DELETE command while using either the ADD or MODIFY functions.

The first prompt from DELETE is for an ID number. Enter the ID number of a record you wish to DELETE. Next, the value of this record's Ordered Element will be displayed, in this format:

```
STATE=aaaaaaaaaaaaaaaaaa
DELETE: YES or NO?
```

If you answer Y or YES, the message Record Deleted should be displayed in a few seconds. If you answer N, NO or anything other than Y or YES, the message Not Deleted will be displayed.

```
Records written=4
Records available=146

Select operation: ADD
                  MODIFY
                  DELETE

Operation?
DELETE
```



```

ID #?
3
STATE=ARIZONA
DELETE: YES OR NO?
NO
**NOT DELETED**
ID #?
4
STATE=ARIZONA
DELETE: YES OR NO?
YES
** DELETED **
RECORDS WRITTEN= 3
ID #?
//STOP

```

IMPac allows you to duplicate Ordered Elements within a master file (i.e. in our example, two or more records could have STATE=OHIO). IMPac cannot always distinguish between two records with identical Ordered Elements when attempting to do a DELETE, however. Therefore, you should use the following method to get a copy of all of the records with the same Ordered Element, so that if IMPac deletes the wrong record, you can then continue, delete the correct record and reenter the improperly-deleted one.

- Enter the ID number.
- DELETE responds with 'Ordered Element Name'=Element Value DELETE: YES OR NO?
- Enter //DUMP. All of the records with this Ordered Element value will be displayed or printed.
- Enter either Y or YES, or N or NO.
- If you entered Y or YES, and more than one record was located in the //DUMP, enter the ID number of one of the other records.
- After getting the display of the value of the Ordered Element for this record, enter //DUMP to find out which records remain.
- If the proper record was deleted, and you wish to delete no further records, enter //STOP. Otherwise, delete the current record.
- Continue this process until the desired record has been deleted, after which you should give the //ADD command and ADD back those records that were incorrectly deleted.

As above, the DELETE process is ended by giving the //STOP command as the answer to a request for an ID number.

Locating the Contents of a Master File with SEARCH

Introduction

The SEARCH program can be started in one of two ways: First, SEARCH can be selected from the program "menu," and second, the `^/SEARCH` command can be used within UPDATE to end UPDATE and begin SEARCH. SEARCH is probably the most important and most useful of all the IMPac programs, because it is through SEARCH that you locate records that meet specifications you supply, and then print or display these records.

SEARCH allows you to set up to fifteen *conditions* that a record must meet, in order to be displayed or printed. These conditions can be *absolute*, *partial* or *range-based*, depending upon your requirements. Further, you have a choice of a variety of output options and formats, which can be either system-defined or user-defined. In addition, you can SORT the records selected in a SEARCH by the order of the values of any element, and then select an output option. The values of any numeric-only or dollars and cents element can be TALLIED, which will give you not only the sum of all the values found, but also the minimum and maximum value, the average and the standard deviation (weighted for sample or population) of each element.

SEARCH Conditions

When you first enter SEARCH, the question:

```
SEARCH CONDITIONS?
```

will be displayed. It is at this point that you can define the characteristics you desire in every record selected. There are a number of conditional forms that can be used; when combined in a single SEARCH, literally thousands of different combinations can be obtained. To use SEARCH properly and speedily, it is important to learn these conditional forms.

Note that whenever you are entering SEARCH Conditions or element lists from the keyboard, you must tell IMPac that you are through by pressing **END LINE** once again at the end of the list.

The "No Conditions" END LINE: If you desire to get a listing or display of *every* record in a master file, it is not necessary to set any conditions whatsoever. (In fact, by setting a condition, you could inadvertently cause SEARCH to disregard one or more records.) To set "no conditions," press **END LINE** when asked for SEARCH Conditions. You will then be able to get a list of every record in the master file.

Number and Selection of Elements: As stated previously, up to 15 conditions can be established for any SEARCH. This does *not* mean that each condition must refer to a different element, however. The same element may be used in more than one condition, provided that all references to an element are kept in order (i.e. all the conditions based on element 1 precede all those from element 2, and so on). Here are some examples:

```
ID<30
```

```
ID=40
```

(This combination will retrieve all records with an ID less than 30, *plus* the record with ID# 40.)

```
CITY=SAN//
```

```
CITY>T//
```

(This combination will retrieve all records with City names starting with SAN, as well as all records with City names starting with U through Z.)

There is a unique case, in which conditions can be disregarded. If you specify the following condition:

```
ID=nnn
```

only the single record with ID# nnn will be considered. Any other conditions will be considered, but only concerning the record with ID=nnn. If these conditions were set:

```
ID=53
```

```
REGION=MIDWEST
```

and the record with ID=53 had, in fact, a REGION of SOUTHERN, no records would be selected.

Another situation of interest is that of *cancelling* conditions (those conditions that, taken together, cannot be met by any records). SEARCH will not warn you if such a situation exists; instead, SEARCH will attempt to locate records meeting the conditions. You would merely get a message at the end of the SEARCH informing you that Total Records=0.

Use of Range Operators: Range conditions are established with the use of the Less Than [$<$] and Greater Than [$>$] search operators. These range conditions are as follows:

Inclusive Range [$>$ $<$]: Only values between the limits of the Range are accepted.

Exclusive Range [$<$ $>$]: Only values outside the range or equal to the limits of the range are accepted.

No upper bound [$>$]: Any value greater than that of the single bound value will be selected.

No lower bound [$<$]: Any value less than that of the single bound value will be accepted.

With inclusive ranges, no other conditions *on the same element* can be used. Thus,

```
ZIP>60000
ZIP<70000
```

is legal, and will select all Zip Codes between from 60001 to 69999, while

```
ZIP>60000
ZIP<70000
ZIP=81040
```

is contradictory, and will be noted with an error. Any other type of range condition can be combined with any type of search operator without errors, however. For example,

```
STATE<NEW YORK    and    STATE<COLORADO
STATE=OREGON      STATE>OKLAHOMA
STATE=OHIO
```

are both fully legal. Note that these restrictions apply *only* to range conditions used with *any one* element. Any range conditions can be freely intermixed when different elements are specified.

'DO' Formats: Definition and Usage: The examples in the preceding text have been fairly simple in nature (only a few elements, only a few conditions). Consider, however, the problems of doing a conditional SEARCH when the number of elements is large and the number of conditions approaches fifteen. If a SEARCH on this volume of conditions is done once or twice, the time and effort necessary to define the conditions, print options, tally options and print formats cannot be justified for each try. If, on the other hand, you must use the same complex set of conditions and print decisions again and again, a problem would soon occur with "duplication of effort" every time you need to do a SEARCH.

IMPac allows you to define a set of SEARCH conditions and print decisions once, and reuse this set again and again by referencing the set with a single number. This capability is called 'DO' Formatting. Approximately 15 'DO' formats, which include all the search conditions, the Print Option selection, the TALLY option and elements, and the print elements, can be stored.

In addition to a "fully-defined" 'DO' format, you can *exclude* some information, which will cause SEARCH to prompt you for the required additional options. The minimum amount of information that any 'DO' format must contain is:

- All SEARCH conditions
- The Print Option (note that SORT cannot be used)
- The Yes-No choice for TALLY
- The elements to be TALLIED, if you answer YES to TALLY

The Print Elements *can* be excluded, if desired.

'DO' Format Layouts: The following rules *must* be followed in creation of a 'DO' format:

- Element *numbers*, not names, must be used (in order to save space).
- Elements must be in their correct order, because `//FORMAT` does not have any logic for checking on element order.
- Each element list is concluded by pressing `(END LINE)`, just as is normally done. The entire 'DO' Format is concluded with a *slash* [`/`].

A sample format would be as follows:

```

//FORMAT           (while in SEARCH)
                    Response: You will be entering CREATE...
                    Is the Master File Initialized?
YES                Enter Operation
//FORMAT           Format Number?
1                  Enter the Conditions:

1>10              (ID>10)
2>MIDWEST         (REGION>MIDWEST)
10=YES            (SERVICE=YES)
(END LINE)

                    Enter Print Option
RE                 Tally: Yes or No
Y                  Tally Elements:
10                (Tally BALANCE)
(END LINE)

1                  (REPORT Element ID)
2                  ("           " REGION)
3                  ("           " STATE)
4                  ("           " CITY)
5                  ("           " BOX)
6                  ("           " STREET)
7                  ("           " ZIP)
8                  ("           " PHONE)
9                  ("           " PRODUCTS)
10                 ("           " SERVICE)
(END LINE)

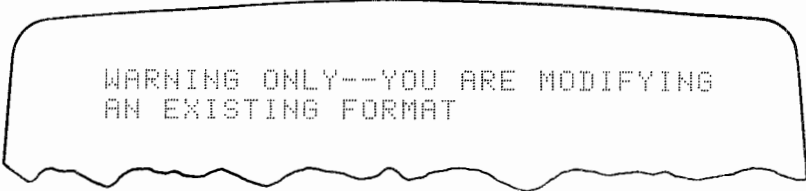
/                  Format Number
//STOP

```



Note that we selected all the elements for printing. If we were not using a 'DO' Format, we could have avoided typing the numbers 1 through 10 by using `//ALL`. `//ALL` is *not* usable in a 'DO' Format, however, and will cause an error message if used.

Also, note that while the example above entered just one 'DO' Format, you could have entered another by entering another number when the `Format Number?` request was displayed. If you enter a Format Number that corresponds to a format already stored, you will get the following message:



```
WARNING ONLY--YOU ARE MODIFYING
AN EXISTING FORMAT
```

Unless you abort the entry with `//ERROR`, you will erase the existing format with this number, and overwrite it with your new one. To display all of the formats presently stored, you can enter `//DUMP` when asked for a `Format Number?`. The following will be displayed or printed:

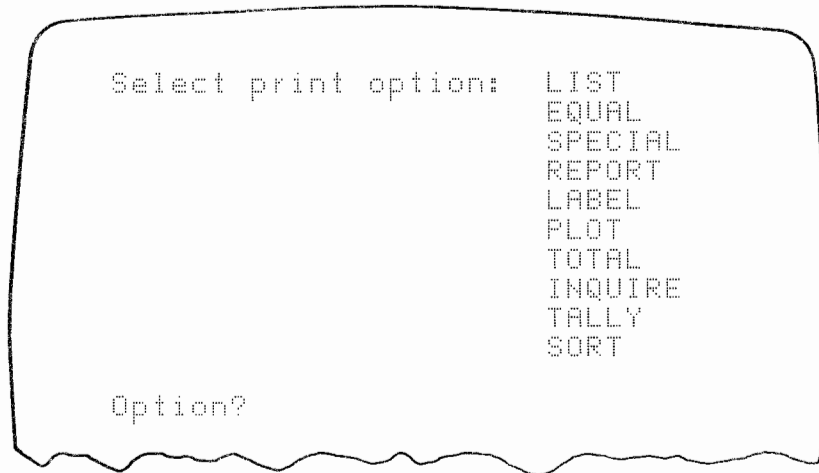
Note: (E)=Endline;

First format number—SEARCH Conditions, (E), Print Option, TALLY Choice, TALLY Elements (if any), (E), Sample or Population Standard Deviations (if any), Print Elements (if any) Second format number—and so on.

If there are no present 'DO' Formats, only the word `END` will be displayed. Also, note that the slash (`/`) that is used to end a 'DO' Format is not stored, and is thus never displayed in a `//DUMP`.

Print Options

Once you have completed entering your `SEARCH` conditions, and have pressed a single `END LINE` to let `SEARCH` know that your list is complete, the following will be displayed:



The first five options (LIST through LABEL) are used for getting a copy of the records located in the SEARCH, printed or displayed in some format. PLOT allows you to use IMPac's four special graphics programs (IMLINE, INCURU, IMBAR and IMPIE) to create graphs with 7225 or 9872 plotters. The TOTAL option displays or prints only the total number of records that met the SEARCH Conditions. INQUIRE displays or prints only one record, based upon an ID number you specify. TALLY defines the element (or elements) you want to sum and get certain statistics upon. SORT changes the order in which the records will be printed, based upon some element that you specify.

Note that any of these options can be selected by entering the *first two characters* of their names, followed by no other letters or any additional letters up to the entire Print Option name. Thus:

```

LI, LIS and LIST are legal
RE, REP, REPO, REPOR, and REPORT are legal, but
L, R, E, or any other single character is illegal.

```

Also note that you tell IMPac to stop requesting further Elements to be printed by entering a single **END LINE** (just as with SEARCH Conditions).

There are three "Page Options" that can be used for additional control over your printed outputs. These options are as follows:

- P Paginate outputs. Page numbers and headings will be printed at the top of each page. You must specify the number of lines per page for your printer.
- W Wide outputs. SEARCH ordinarily prints 72-character lines, but W specifies 132-character maximum lines.

-F Print SEARCH outputs in a data file. This option will print/display SEARCH outputs, and simultaneously write the same information to a file you specify. The file will be written with one printed record stored in one data record, so your file must have at least as many records as SEARCH located. Each data record must be big enough to store a "print-formatted" SEARCH record.

-P can be used with EQUAL, SPECIAL and REPORT: **-W** and **-F** can be used with LIST, EQUAL and SPECIAL. The format for these options is as follows:

AA-B, where AA is the first two letters of the Print Option, and B is the Page Option. Thus, SP-W specifies SPECIAL with Wide Pages. Options can be used together; SP-WP, for example, is legal.

```

Current mass storage name:IMP
Current data file name:SALES

Enter search conditions?

```

```

Select print option: LIST
                    EQUAL
                    SPECIAL
                    REPORT
                    LABEL
                    PLOT
                    TOTAL
                    INQUIRE
                    TALLY
                    SORT

Option?
SP-WP

```

TALLY Within a Print Option: If you select LIST, EQUAL, SPECIAL, or REPORT, you will first be asked whether or not you wish to TALLY any elements. If you answer N or NO, you will then be asked for the elements that you wish to Print. If you answer Y or YES, you will be asked for the element or elements that you wish to TALLY. In both cases, you may enter element names, element numbers, or a combination of both. The element list is concluded with an **END LINE** as the only response to a request for an element name or number.

Note that only Numeric-Only and Dollars elements can be TALLIED. This is due to the fact that alphanumeric elements cannot be directly converted into numbers for arithmetic processing. If you attempt to TALLY an Alphanumeric element, an error message will be displayed. Also, because of the intermixing of Alphanumeric, Numeric-Only and Dollars element in any master file, you cannot use the `///ALL` command to TALLY all the elements; an error message will be displayed if you attempt to use `///ALL` in a TALLY.

If you answered YES to the TALLY question, you will then be asked to Enter choice for Standard Dev. weighting (Sample or Population)?. The TALLY function automatically takes the mean, the minimum and maximum, and the standard deviation of each element you select to TALLY. You cannot select different standard deviation weightings for each element, but you *must* select an *overall* weighting. ("Sample" weighting is sometimes referred to as "N-1" weighting, while "Population" weighting is referred to as "N" weighting.) Legal responses are S, SAMPLE, P, POPULATION, N and N-1.

Once you have decided which weighting to use, and have entered this into SEARCH, you will then be asked for the elements to be printed. Enter these one at a time. If you initially selected TALLY as the Print Option, however, there will be no request for print elements. This is because TALLY, as a stand-alone Print Option, will print *only* the final TALLY information, and not the values of any elements. Therefore, if you are interested only in the sum of all the values that meet a certain condition (or conditions), and not in the individual values of the elements, use TALLY.

```
TALLY? YES OR NO:?
Y
TALLY ELEMENTS:
  1 : ?
ZIP
  2 : ?

Enter choice for Standard Dev.
weighting (Sample or Population)
?
S
SPECIAL
ENTER # OF LINES PER PAGE?
66
Element, Field Width:
?
ID'5
?
REGION'10
?
STATE'20
?
CITY'25
?
```

```

WARNING:  NULL VALUE DETECTED IN
TALLIED ELEMENT(S).
Again?
NO

```

The LIST Option: The simplest description of LIST is that it is an “unformatted” printing option. After selecting LIST, you will be asked for a list of elements that you wish to be printed. Once you finish your selection by entering an `END LINE`, your selections will be printed as follows: The first item printed is ID and the ID number. Following this, the elements you selected will be printed or displayed one after another on the line. LIST will put as many values as it can on the first line, and then start printing or displaying a second line with remaining values for this element. When the values for this record have been completely printed or displayed, a blank line will be output to separate the record from the next one to be printed.

The EQUAL Option: There are two Print Options that allow you to put your records into columnar format: EQUAL and SPECIAL. EQUAL prints the elements you select in columns of equal width, while SPECIAL allows you to dictate the width of each column. EQUAL columns are fifteen (15) characters wide, and so four elements can be printed or displayed on a 72-column line, while eight elements can be printed or displayed on a 132-column line.

Each column output by EQUAL is headed with the name of the element that the column represents. A blank line is printed after the element names, and then the data records are printed, with no blank lines in-between.

It is important to keep column widths in mind when selecting elements to be printed in EQUAL. If you select too many elements (more than four in the 72-column case, or eight with 132-columns), EQUAL will display a fatal error message, because the available storage space will “overflow.” For this reason, EQUAL should be used for printing only a limited number of elements at any one time.

The SPECIAL Option: As discussed under EQUAL, there are two Print Options that allow you to create outputs in a columnar form. The first is EQUAL, which uses columns of fixed, equal size. The second is SPECIAL, in which you can define each column width according to your needs.

When you select SPECIAL, you will get a prompt that is different from those in most of the other Print Options. Unlike the usual opening prompt of `ELEMENTS:`, SPECIAL begins by displaying:



```

Elements' Column width

```

You can use the same elements as with any Print Option, but the SPECIAL option also requires a column width to be specified. The format is as follows: Element name or number, *apostrophe*, column width. As examples:

3'5 would say to print Element # 3 in a column 5 characters wide.

ID'3 means print IDs in a column 3 characters wide.

SPECIAL keeps a count of the column widths you select. If you overrun the available space, SPECIAL will give you a non-fatal error message; you will then have to re-enter the element names or numbers and column widths to stay within the available space.

As with EQUAL, column titles are printed (the names of the elements you selected), then a blank line, and the values of the records that met your SEARCH Conditions. If a column is insufficiently wide to display the entire value of an element, the value printed will be truncated to fit the space, starting with the right-most character of the value.

```
Current mass storage name:IMP
Current data file name:SALES

Enter search conditions?
```

```
Select print option: LIST
                    EQUAL
                    SPECIAL
                    REPORT
                    LABEL
                    PLOT
                    TOTAL
                    INQUIRE
                    TALLY
                    SORT

Option?
SO
SORT ON WHICH ELEMENT?
REGION
```

```

Select print option: LIST
                    EQUAL
                    SPECIAL
                    REPORT
                    LABEL
                    PLOT

```

```

Option?
SP-WP
TALLY?  YES OR NO?
NO
ENTER # OF LINES PER PAGE?
66

```

```

Element, Field Width:
?
1'5
?
REGION'10
?
3'20
?
CITY'25
?

```

The REPORT Option: Unlike the EQUAL and SPECIAL printing options just discussed, REPORT is line-oriented, not column-oriented. In other words, element values are printed one to a line, instead of together in a single line with defined columns. The output of REPORT is a listing of the element names and values for each record found to meet the SEARCH Conditions. A sample REPORT could look like this:

```

ID: 47
REGION: EASTERN
STATE: NEW YORK
CITY: ALBANY
BOX: P.O. BOX 10350
STREET: 2300 8TH STREET
ZIP: 10350
PRODUCTS: ALL

```

```

ID: 55
REGION: MIDWEST
:
:
:

```

Since the output from REPORT is printed in this fashion, it can readily be used to get a display of the records on the CRT, or to get a printed output from the HP-85's internal thermal printer. The column-oriented print options can be used with these devices as well, of course, but a 72 or 132-column printer will give properly-formatted outputs with EQUAL and SPECIAL, while these columns will be "staggered" along the page with the HP-85 thermal printer.

The LABEL Option: The LABEL print option is unique among the SEARCH options, in that it uses a special label formatting and printing program (LABEL). You do not need to run the LABEL program; SEARCH will run it automatically. (Note that you can run LABEL by itself, however, so long as the record number file to be manipulated is present.)

LABEL uses a unique method of handling element order. The IMPac programs in general, and most of the other print options, require that elements be selected and printed in the order in which they are found in the master file. LABEL, however, allows you to specify elements to be printed in any order. You can select up to twelve (12) elements to print in each label, and you can print on from one to eight lines for each label. In addition, you can put more than one element on any one line; the element values will be separated by single spaces.

For the LABEL program to work, a special file must be built; this file is called SORT, and is the same file used in the SORT print option and the /RESEQUENCE command in UPDATE. This file holds the record numbers of the records that fulfill the SEARCH Conditions. When you select LABEL, this file is built automatically. (If you have selected the SORT print option, and then LABEL, the LABEL program will use the record numbers generated by SORT, instead of creating a new data file.)

Note that you can select from 1 to 12 elements to be printed on 1 to 8 lines. You can print from 1 to 4 labels on a line, and you can define where you want each column of labels to start printing. In addition, you can print from 1 to 10 copies of each label. As you can see, LABEL is a fairly useless print option for the HP-85 internal thermal printer, because of the 32-character page size. If you intend to use LABEL efficiently, it is suggested that you use a 80-column or 132-column impact printer.

```

Select print option: LIST
                    EQUAL
                    SPECIAL
                    REPORT
                    LABEL
                    PLOT
                    TOTAL
                    INQUIRE
                    TALLY
                    SORT

Option?
LA

```

There are a maximum of eight lines on each Label.

Enter element(s) on line 1

?

BOX

Enter element(s) on line 2

?

STREET

Enter element(s) on line 3

?

CITY,STATE,ZIP

Enter element(s) on line 4

?

HOW MANY LABELS DO YOU WANT TO PRINT ACROSS THE PAGE (1-4)?

1

ENTER COLUMN YOU WANT LABEL# 1 TO START PRINTING IN?

6

HOW MANY COPIES OF EACH LABEL DO YOU WANT (1-10)?

2

HOW MANY BLANK LINES BETWEEN EACH ROW OF LABELS?

3

The TOTAL Option: TOTAL is not truly a print option, although it is included in the list of options available. It can be more accurately described as a “non-print” option, because the function of TOTAL is *not* to print any element values, *only* the total number of records found that meet the specified SEARCH Conditions.

TOTAL is useful if you want to determine whether a set of SEARCH Conditions does, in fact select any records. (A set of conditions that end up selecting no records would print a TOTAL of zero.) TOTAL is also useful in getting the number of records that fulfill a set of SEARCH Conditions, for comparison with the total number of records in a master file. (For example, if you know that there are 1000 records already stored in a master file, and a set of SEARCH Conditions locates a total of ten records, you know that 1% of the master file meets these conditions.)

Since TOTAL does not print any element values, it is unnecessary to define any elements to be printed. Thus, unlike the previous print options, after you select TOTAL, you will not be asked for any elements to be printed. The record search will begin immediately.

The INQUIRE Option: INQUIRE is a print option that does not make use of any SEARCH Conditions. Thus, whether or not you specified any SEARCH Conditions prior to selecting INQUIRE will make no difference. The function of INQUIRE is to print out the entire contents of any single record in the master file, located by ID number.

When you select INQUIRE, you will be asked for an ID number. This must be the ID number of the record you wish to print or display. After entering this value, INQUIRE will search the master file for the record with this ID number, and if found, will print the value of every element in the record in REPORT format. This means that the element name will be printed, followed by the element value, with one element to each line.

The TALLY Option: TALLY is similar to TOTAL, in that no element values are printed. The output of the TALLY Option is identical to that outputted after the end of the element values, whenever TALLY is selected within another Print Option. Thus, for each element you select to TALLY, you will receive the following information on the records found to meet the SEARCH Conditions:

- The element name
- The summation of all values found for this element
- The largest value located
- The smallest value located
- The mean (average) of the element values
- The standard deviation (either sample or population) of the element values.

A word of caution (applicable to TALLYing within a Print Option as well): If a record has no value for an element, you cannot enter just an `END LINE`, because `UPDATE` takes this as your signal that you are finished entering element values. You should instead enter a dash (`—`). `TALLY` detects these dashes, and does not attempt to obtain a value for the element in question. Thus, a dash will not show up in the maximum or minimum results. `TALLY` does *not* subtract the records with no value from the total number of records found, however, so both the means and the standard deviations calculated could be incorrect. (The message `WARNING: NULL VALUE DETECTED IN TALLIED ELEMENT(S)` is printed if null values are located while TALLYing.)

The SORT Option: `SORT` is a print option that *modifies the output* of another option. `SORT`, by itself, outputs only a data file with record numbers, which is then used by another print option to output the records so located. The purpose of `SORT` is to get a `SEARCH` output printed in an order other than that of the Ordered Element.

It is useful, at this time, to remember how the outputs of `SEARCH` are usually printed, which is in the order of the Ordered Element (defined when the master file was created, or changed through the `RESEQUENCE` command in `UPDATE`). In one example, the Account Number was defined as the Ordered Element, and so all outputs of `SEARCH` would be printed in the order of the Account Numbers of the records.

With `SORT`, however, we can define another element that the outputs should be ordered on, without permanently changing the Ordered Element. When `SORT` is selected, the message `Order on which Element?` appears. Enter the element name or number of the element that you wish the outputs to be sorted upon. For example, by entering `NAME`, the outputs would be printed in the order of the names in the Master File.

If you tell `SORT` to use the element that is already the ordered Element, no `SORT` file will be built, because the outputs are already printed and/or displayed in the order of the Ordered Element. If you select another element, however, you will then be asked to again select a Print Option. This time, however, your choices will *only* be `LIST`, `EQUAL`, `SPECIAL`, `REPORT`, `LABEL` and `PLOT`. These choices will be displayed, while `TOTAL`, `INQUIRE`, `TALLY` and `SORT` will not be, since it would be illogical to use `SORT` with a print option that does not print element values (`TOTAL` and `TALLY`) or prints only the values stored in one record (`INQUIRE`). You cannot use `SORT` again, because it has already been selected.

`SORTing` speed is dependent upon the number of records to be `SORTed`, the position of the element upon which the records are to be `SORTed` in each record, and the disc drives used. (In general, 9895-type disc drives `SORT` twice as fast as 82900-type drives.)

The PLOT Option: You may select the `PLOT` Print Option instead of any of the other “printing” functions, such as `LIST`, `EQUAL`, `SPECIAL`, `REPORT`, etc. `PLOT` can also be used with `SORT`, so you can specify an element to order the `SEARCH` outputs on, and then specify `PLOT`.

TALLYing within PLOT is handled somewhat differently than TALLY within the other Print Options. You can either PLOT element values directly, or you can PLOT the outputs of a TALLY, but you cannot mix the two. In addition, you can PLOT either two sets of element values or a set of TALLY results against an index (Line and Curve PLOTS), or one series of element values or one set of TALLY results (Pie and Bar Chart PLOTS). You must also select one of the TALLY functions for each line (total, average, maximum, minimum or standard deviation) if you desire to plot TALLY values.

PLOT operates as a program separate from SEARCH. PLOT can be used within SEARCH automatically by selecting the PLOT Print Option, and can additionally be run as an independent program by entering `LOAD "PLOT" ENDLINE RUN`. As with SORT and LABEL, PLOT requires that an external datafile, called "SORT," be created with the record numbers of the records identified by the SEARCH Conditions. If SORT was used prior to selecting PLOT, the SORT file created will be used by PLOT. If SORT was not used prior to selecting PLOT, a new SORT file will be created.

When the PLOT program begins, you will be asked for the name of the new data file to be created. This file will hold the element *values* to be used by the IMPac graphics programs. You do not need to specify a volume label, because PLOT will first attempt to create the data file on the data mass storage device. If there is insufficient room on this device, PLOT will attempt to create the file on the program mass storage device. If there is no room on this device as well, an error message will be displayed. (Note that, if you give the new file the same name as an existing file, PLOT will first purge the existing file, and then create a new data file with the same name.)

If PLOT completes this step without error, the program will then display the message: `Select Plot Type`, and a soft key "menu" with the following items on the first four keys:

LINE CURVE PIE BAR



Selecting a Plot Type will automatically prompt you for the data necessary to build a plotting file in the format necessary for each of the four IMPac graphics programs. `IMLINE` and `IMCURV` (Line and Curve plots) use data files built in "x-y" two-column format, with from 1 to 150 x-y pairs. (The file looks something like this: Element I, value 1; element II, value 1; element I, value 2; element II, value 2; and so on.) Only *numbers* can be processed by `IMLINE` and `IMCURV`, so only Numeric-only and Dollars elements can be used.

`IMPIE` uses a different format. Values are stored as pairs of labels and numeric values, with from 1 to 25 pairs stored per file. (An `IMPIE` file looks like this: Label#1, Value#1; Label#2, Value#2; and so on.) PLOT prompts you for the label name associated with each "slice" of the pie(s).

Bar charts, plotted with `IMBAR`, can also display from one to 25 values as bars. These values are stored as Value#1, Value#2, Value#3 and so on. `IMBAR` (not PLOT) requests the legend for each bar.

PLOT handles the formatting of the data files automatically, depending upon which plot type you select. The ability of the IMPac graphics programs to handle this data will influence and control the types of data you can use and the kind of plots that can be created.

EXTEND: Changing the Size of Master Files and/or File Records

Introduction

The problem of defining a realistic master file length (number of records) and record length (number of bytes per record) has been discussed previously. You want to specify enough records to handle your foreseen storage requirements. You do not want to allocate too many, however, because once allocated, they cannot be used for any file other than the master file. This is true even though many of the allocated records are not needed for months. At the same time, by setting up a large allocation of records, you may run out of room on your disc for holding the additional header, storage and scratch files necessary to run IMPac.

By the same token, you do not want to allocate too few records for your realistic short-term needs, because the EXTEND process is time-consuming, and becomes longer as the number of records in the master file increases. Record size is also important; records that are too big both waste space and increase disc access times (thus slowing down IMPac), while records that are too small cannot hold all the information you need to store.

Record size becomes especially critical if you decide to add elements to an existing master file. Remember that master file record lengths are calculated by adding together the maximum element sizes you specified in CREATE, and then multiplying the sum of these lengths by 1.1 (giving you a 10% error factor for growth). Adding elements does not increase the length of the records, however; it merely packs more elements into the same space. You may find that by adding elements to a master file that had plenty of room to start, you may often get error messages to "start over, abbreviating where possible."

For all these reasons, it is necessary to have a tool to increase or decrease record and file lengths, as your experience with each IMPac master file increases. This tool is the IMPac EXTEND Program.

EXTEND Dialogue

EXTEND can be run by selecting this program from the "menu." When EXTEND begins, it "assumes" that you wish to modify the size and/or length of the current IMPac master file. Therefore, if you want to extend a master file *other* than the current one, you must first select NEW-FILE from the program "menu," specify the new master file, and then select EXTEND.

The first thing that `EXTEND` does is determine what the current master file is, and on which volume it resides. Secondly, `EXTEND` gets the present master file parameters from the header file, and displays the current number of records and record size of the master file. Finally, you are asked where you want the new file to be created (The Series 80 file manager cannot merely add or remove records from an existing file. It must create a *new* file with the proper record size and file length. `EXTEND` then writes the existing data from the master file into the new file.). This file is always named "GARBAGE," and can be created on any mass storage unit.

After you specify where you want the new file built (the default is the existing mass storage unit), `EXTEND` asks whether or not you want to change the number of records in the file. If you answer `N` or `NO`, `EXTEND` goes to the next series of questions. If you answer `Y` or `YES`, `EXTEND` asks for the new number of records, which may be either less than or greater than the existing number. If you select a number which is both less than the existing number and lower than the number of records that the header file says has been written with active data, the following warning message will be displayed:

```
YOU WILL BE DELETING EXISTING
RECORDS. ARE YOU SURE YOU WANT
TO DO SO?
```

By answering `Y` or `YES`, the number of records will be changed. By answering `N` or `NO`, you will be asked again for the new number of records (the existing number will not be changed).

The next series of questions begins with `Do you wish to change the record size?` By answering `N` or `NO`, `EXTEND` will begin creating the new file. By answering `Y` or `YES`, `EXTEND` will next ask for the new record size *in bytes*. As with the file length, this number can be either less than or greater than the existing record size. If you select a size less than that presently defined, the following warning message will be displayed:

```
YOU MAY DESTROY SOME RECORDS.
ARE YOU SURE?
```

An answer of `Y` or `YES` will change the record size; an answer of `N` or `NO` will cause `EXTEND` not to change the record size, and to ask again for the new record size.

Once you have defined the changes you wish to make, `EXTEND` will attempt to create the "GARBAGE" file with the attributes you have selected. If there is insufficient room on the selected mass storage device to store the new file, an error message will be displayed, and `EXTEND` will terminate. If room exists, both a new master file and a new header file ("HGARBA") will be created. The data from each existing file will be written, record by record, into the new files. At the end of this process, the following message will be displayed:

```
EXTEND COMPLETED.  LAST RECORD  
WRITTEN:  nnn
```

Note that EXTEND does not purge the existing files themselves. This is done because there is the possibility that the EXTEND program could fail to fully copy the data files. If the master and header files were then purged, the data would be lost. Therefore, you should insure that the EXTEND process was completed without error before purging the existing data files.

Notes

Section 6

Graphing With IMPac

This section explains how to use the file stored by PLOT in conjunction with one of the four BASIC graphics programs to create graphs that depict IMPac data.

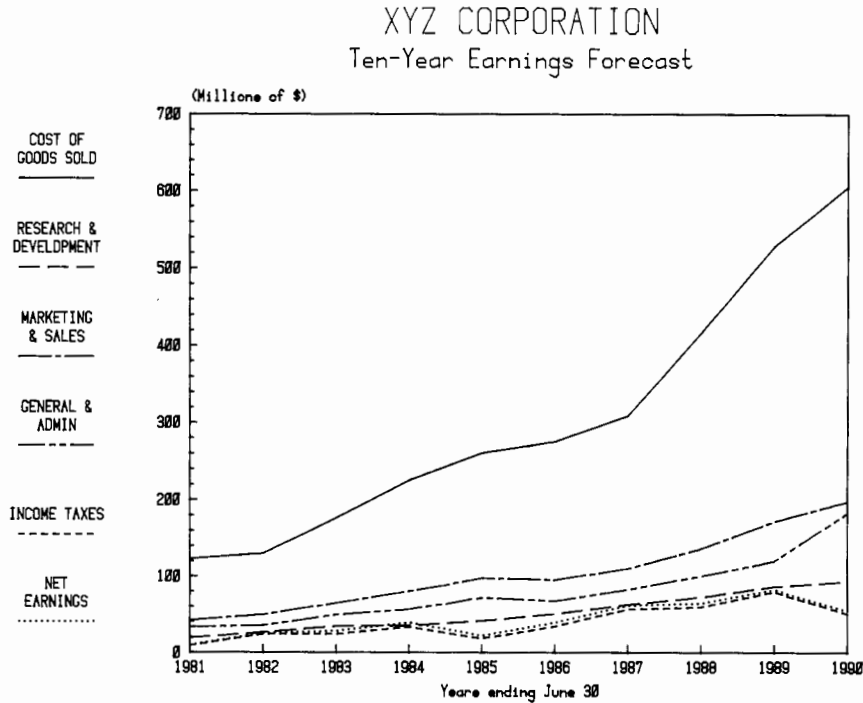
Besides the programs on the disc provided with IMPac, and the hardware required to run IMPac, you will need the following items in order to create graphics that depict IMPac data:

- HP 00085-15002 Plotter/Printer ROM
- Plotting device, such as HP 9872, HP 7225, or equivalent.

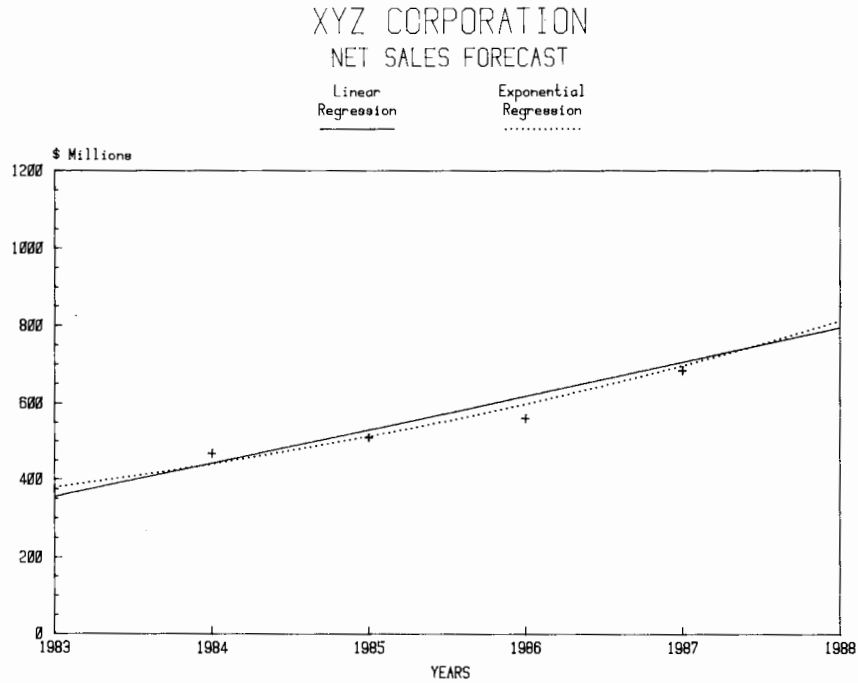
Graphics Programs

The four IMPac graphics programs provided are IMLINE, IMCURV, IMPIE and IMBAR, and they can generate the following types of plots:

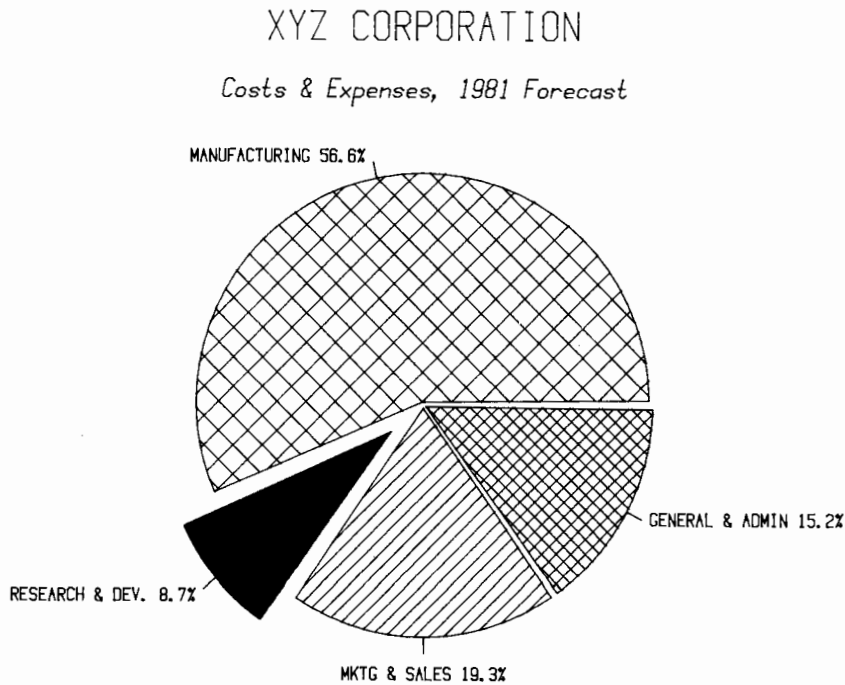
Line Charts: IMLINE produces line plots which may be linear, logarithmic, or semi-logarithmic. You can plot as many as six lines per chart, and each line can consist of up to 150 data points.



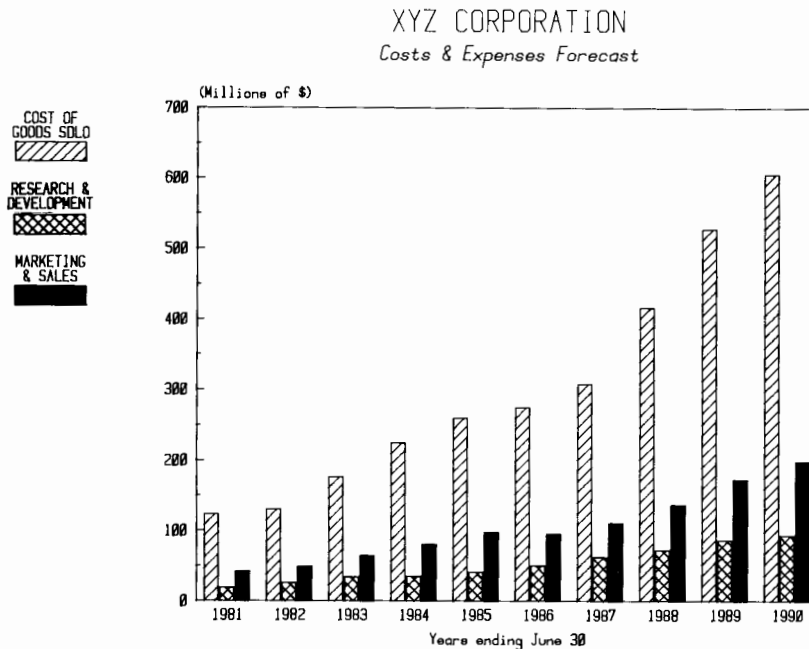
Curve Fitting: IMCURV plots a set of up to 250 data points and then permits you to fit up to four standard curves to the points. The standard curves are linear, logarithmic, exponential, and power.



Pie Charts: IMPIE plots one or two pies on a single chart. Each pie may consist of from two to 25 slices, and you can specify any slice as normal or exploded from the rest of the pie. Pie charts also have six shading (hatching) options.



Bar Charts: IMBAR permits you to specify normal, stacked or clustered bars. There can be up to 25 normal bars, stacks or clusters on a single plot. Each stack or cluster, in turn, may contain up to six bars. Like pie charts, bar charts have six shading (hatching) options.



All plots can use up to four pen colors, and all permit you to specify titles in upper- and lower-case, upright and slanted characters.

Running the Graphics Programs

To run one of the IMPac graphics programs, merely turn to the section of this manual that details its operation, then follow the simple cookbook-style instructions. Each graphics program prompts you for all inputs as they are needed.

All graphics programs allow you to generate an abbreviated plot on the computer's CRT screen (no peripheral plotter need be attached), as well as allowing for a full plot on a peripheral device. Each graphics program allows you to title the entire chart and to label axes, legends, pie slices, etc. You also have various editing options within each program.

Each of the programs makes use of the special function keys (K1-K8). Whenever you are using these keys, one of them is designated as the HELP key; it generates an amplified description of the key functions for you.

Preparing IMPac Data for Graphing

To plot data, each of the four graphics programs require that your IMPac data first be arranged in a special format and stored on tape or disc. This is accomplished with the PLOT function of the SEARCH program; the PLOT routine is explained within the SEARCH section of this manual. Throughout the following plotting program descriptions, the terms *IMPac data file* and *PLOT file* both refer to a file created with the PLOT function. These files are then utilized by the graphics programs.

Each of the four IMPac graphics programs can summon data from only two kinds of files:

1. *IMPac (I) Data File*: A file created with the PLOT function of SEARCH.
2. *Converted IMPac (C) Data File*: A special file stored by the graphics program itself. A converted IMPac data file contains not only data (often from several PLOT files), but also all graphing information, including titles, labels, pen colors, axes, etc. Each file is usable only by the IMPac graphics program which created it.

Data used in a graphics program may have originally been arranged in a specific format, then stored in an IMPac data file using the PLOT function in SEARCH. You can refer to the individual section for a specific program to determine the PLOT IMPac data file format you will need.

To switch between graphics programs, simply load the new graphics program.

Line Charts

The IMLINE program permits the data in up to six IMPac data files, or a single converted IMPac data file, to be used to create a graph of from one to six lines. From a single IMPac data file, one line may be graphed; from two files, two lines may be graphed along the same axes, etc. Each line may be plotted using up to 150 (x, y) data points.

The graph can be linear, logarithmic or semi-logarithmic, and you can plot a chart title and subtitle in addition to the X- and Y-axis titles. You can specify both labeled major units of measure and unlabeled ticks along the axes, and an additional option permits you to plot a grid on the graph. A special feature allows X-axis units of quarters, months or days. (Years are treated as numeric data.)

To use the program, you must know the values of the data; a special option permits review of the raw data in the IMPac data file.

User Instructions for Line Charts

1. To load the line chart program:
 - a. Insert the IMPac disc.
 - b. Type `LOAD "IMLINE" END LINE`.
2. Ensure that a suitable IMPac data file (PLOT) is available for each line, or that a converted IMPac data file (i.e., a file that has been stored from the IMLINE program, and which contains all graphing information in addition to date) is available on the current mass storage device.
3. To start the program, press `RUN`.
4. When `(Select I/C)?` is displayed:
 - a. Enter I `END LINE` to select one or more IMPac data files.
 - b. Go to step 5.
 OR:
 - a. Enter C `END LINE` to select a converted IMPac data file.
 - b. Go to step 40.
5. When `Number of lines to be graphed Enter 1-6?` is displayed:
 - a. Enter the number of lines, from one to six, that will appear on the plot. A separate IMPac data file (PLOT) must exist for each line. Then press `END LINE`.
6. When `Enter file name for line #1 (Press END LINE) for catalog? (or Enter file name for another line)` is displayed:
 - a. Press `END LINE` to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.
 OR:
 - a. Enter the name of the file containing the data (x, y coordinates) for this line, then press `END LINE`.
7. You can review the data on the PLOT file, to help answer later questions on file format, X-axis and Y-axis scaling, line legends and labels. When `Review data: . . . (Select P/D/N)?` is displayed:
 - a. Press `END LINE` to continue without reviewing the data.
 OR:
 - a. Enter P `END LINE` to print the data as it is read from the IMPac data file.
 - b. After the data is printed, press `CONT`.
 OR:
 - a. Enter D `END LINE` to display the data as it is read from the IMPac data file.

- b. After the data is displayed, press **CONT**.
8. When X-axis row (Upper or Lower)? is displayed:
- Press **END LINE** if the upper row of data is to make up the X-coordinates on the plot.
 - Go to step 9.
- OR:
- Enter L **END LINE** if the lower row of data is to make up the X-coordinates on the plot.
 - Go to step 9.
9. When Legend for Line #1 (or Legend for another line) (FIRST 12 char.)? is displayed:
- Enter the first portion (1-12 characters) of the desired legend for this line, followed by **END LINE**.
- OR:
- If no first portion of legend is desired, press **END LINE** and go to step 11.
- Note: If a legend for the line has already been entered and is now being edited, the original legend appears with the cursor beneath the prompt. You can enter a new legend, alter the original legend, or leave the original unchanged.
10. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the first portion of the legend for this line is not to be slanted when plotted.
- OR:
- Enter Y **END LINE** if the first portion of the legend is to be slanted.
- Note: If a legend for the line has already been entered, a Y or N for slanted legend appears with the cursor. You can change the Y or N for the legend or you can leave it unchanged.
11. When Legend for Line #1 (or Legend for another line) (LAST 12 char.)? is displayed:
- Enter the last portion (1-12 characters) of the legend for this line, followed by **END LINE**.
- OR:
- If no last portion of legend is desired, press **END LINE** and go to step 12.
- Note: If a legend for the line has already been entered and is now being edited, the original legend appears with the cursor beneath the prompt. You can enter a new legend, alter the original legend, or leave the original unchanged.
12. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the final portion of the legend for this line is not to be slanted when plotted.
 - Go to step 13.
- OR:
- Enter Y **END LINE** if the final portion of the legend for this line is to be slanted.
 - Go to step 13.
- OR:
- Return to step 49 if a previously entered legend was edited.
- Note: If a legend for the line has already been entered, a Y or N for slanted legend appears with the cursor. You can change the Y or N for the legend or you can leave it unchanged.

13. When `Select pen color...`

`Enter 1-4?` is displayed:

- a. Enter 1, 2, 3 or 4 to select the color of ink (black, red, green, or blue, respectively) for this line. Then press `END LINE`. (Default color is black.)
- b. Go to step 6 to specify next line.

OR:

- b. Go to step 14 if files and legend for all lines have been specified.

OR:

- b. Return to step 49 if pen color was edited.

Note: You are not prompted for the plotted form of the line (solid, dashed, etc.). The program automatically assigns a unique form to each line.

14. When `X-axis type:`

`(LINEar/LOG)?` is displayed:

- a. Press `END LINE` if the X-axis is to be a linear scale.

OR:

- a. Enter `LOG` `END LINE` if the X-axis is to be a logarithmic scale.

15. When `Y-axis type:`

`(LINEar/LOG)?` is displayed:

- a. Press `END LINE` if the Y-axis is to be a linear scale.

OR:

- a. Enter `LOG` `END LINE` if the Y-axis is to be a logarithmic scale.

16. When `Grid (Y/N)?` is displayed:

- a. Press `END LINE` if you do not want a grid on the plot.

OR:

- a. Enter `Y` `END LINE` if you want a grid on the plot.

17. The program prompts for units of measure along the X-axis. If a logarithmically-scaled X-axis has been specified, the program will change it to a linear X-axis if quarters, months, or days are specified as the unit of measure. When `X-axis units:` is displayed:

- a. Press `END LINE` for an X-axis of numeric units. (Numeric units include years.)
- b. Go to step 24.

OR:

- a. Enter `Q` `END LINE` for an X-axis of quarters.
- b. Go to step 18.

OR:

- a. Enter `M` `END LINE` for an X-axis of months.
- b. Go to step 20.

OR:

- a. Enter `D` `END LINE` for an X-axis of days.
- b. Go to step 22.

18. When `First Quarter # :` is displayed:

- a. Enter a number specifying the first quarter shown on the X-axis, followed by `END LINE`. Enter 1 for 1st, 2 for 2nd, etc.

19. When `Last Quarter # :` is displayed:

- a. Enter a number specifying the last quarter to be shown on the X-axis, followed by `END LINE`. Enter 4 for 4th, 5 for 1st, 6 for 2nd, etc.
- b. Go to step 26.

20. When `First Month #:` is displayed:
 - a. Enter a number specifying the first months to be shown on the X-axis, followed by `END LINE`. Enter 1 for January, 2 for February, etc.
21. When `Last Month #:` is displayed:
 - a. Enter a number specifying the last month to be shown on the X-axis, followed by `END LINE`. Enter 11 for November, 12 for December, 13 for January, etc.
 - b. Go to step 26.
22. When `First Day #:` is displayed:
 - a. Enter a number specifying the first day shown on the X-axis, followed by `END LINE`. Enter 1 for Sunday, 2 for Monday, etc.
23. When `Last Day #:` is displayed:
 - a. Enter a number specifying the last day to be shown on the X-axis, followed by `END LINE`. Enter 7 for Saturday, 8 for Sunday, 9 for Monday, etc.
 - b. Go to step 26.
24. When `Minimum X-axis value?` is displayed:
 - a. Enter the minimum value to be graphed along the X-axis, followed by `END LINE`.
25. When `Maximum X-axis value?` is displayed:
 - a. Enter the maximum value to be graphed along the X-axis, followed by `END LINE`.
26. When `Units between X-axis labels?` is displayed:
 - a. Enter the value (distance) you want between each label on the X-axis, followed by `END LINE`.
27. When `Units between X-axis tics?` is displayed:
 - a. Enter the value (distance) you want between each unlabeled tic on the X-axis, followed by `END LINE`.
28. When `Minimum Y-axis value?` is displayed:
 - a. Enter the minimum value to be graphed along the Y-axis, followed by `END LINE`.
29. When `Maximum Y-axis value?` is displayed:
 - a. Enter the maximum value to be graphed along the Y-axis, followed by `END LINE`.
30. When `Units between Y-axis labels?` is displayed:
 - a. Enter the value (distance) you want between each label on the Y-axis, followed by `END LINE`.
31. When `Units between Y-axis tics?` is displayed:
 - a. Enter the value (distance) you want between each unlabeled tic on the Y-axis, followed by `END LINE`.
 - b. Go to step 32.

OR:

 - b. Return to step 49 if axes were edited.
32. When `Enter chart title (32 char. max.)?` is displayed:
 - a. Enter the main title (1-32 characters) for the entire chart, followed by `END LINE`.

OR:

 - a. If no main title is desired, press `END LINE` and go to step 34.
33. When `Slanted label (Y/N)?` is displayed:
 - a. Press `END LINE` if the characters in the chart title are not to be slanted.

OR:

 - a. Enter Y `END LINE` if the characters in the chart title are to be slanted.

34. When Enter chart subtitle (32 char. max.)? is displayed:
- Enter the subtitle (1-32 characters) for the chart, followed by **END LINE**.
- OR:
- If no subtitle is desired, press **END LINE** and go to step 35.
35. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the subtitle are not to be slanted.
- OR:
- Enter Y **END LINE** if the characters in the subtitle are to be slanted.
36. When Enter X-axis title (32 char. max.)? is displayed:
- Enter the title (1-32 characters) for the X-axis, followed by **END LINE**.
- OR:
- If no X-axis is desired, press **END LINE** and go to step 38.
37. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the X-axis title are not to be slanted.
- OR:
- Enter Y **END LINE** if the characters in the X-axis title are to be slanted.
38. When Enter Y-axis title (32 char. max.)? is displayed:
- Enter the title (1-32 characters) for the Y-axis, followed by **END LINE**.
- OR:
- Press **END LINE** if no Y-axis title is desired.
 - Go to step 41.
- OR:
- Return to step 49 if titles were edited.
39. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the Y-axis title are not to be slanted.
- OR:
- Enter Y **END LINE** if the characters in the Y-axis title are to be slanted.
 - Go to step 41.
- OR:
- Return to step 49 if titles were edited.
40. When Enter file name: (Press **END LINE**) for catalog? is displayed:
- Press **END LINE** to see a catalog of the files available on the current mass storage device. This catalog is generated on the current PRINTER IS device.
- OR:
- Enter the name of a converted IMPac data file, containing data, labels, titles, etc. for all lines on a single graph. Then press **END LINE**.
41. The program displays the functions of the special function keys (K1-K8). When Select Option: is displayed and the keys are labeled:
- ```

PLT-CRT GET-DAT EXIT HELP
PLOTTER SAV-DAT LIST EDIT

```
- Press KEY #1 (PLOTTER) to plot the graph on a peripheral plotter.
  - Go to step 42.
- OR:
- Press KEY #2 (SAV-DAT) to save all data, as well as all titles, labels, pen codes, etc., as a converted IMPac data file on a tape cartridge or disc.
  - Go to step 47.
- OR:
- Press KEY #3 (LIST) to list all data, titles, labels, etc., for this set of lines.
- OR:

- a. Press KEY #4 (EDIT) to edit the data, titles, legends, axes specifications or pen colors.
- b. Go to step 49.
- OR:
- a. Press KEY #5 (PLT-CRT) to obtain an abbreviated plot on the CRT display screen.
- b. Go to step 45.
- OR:
- a. Press KEY #6 (GET-DAT) to load an IMPac data file or a converted IMPac data file.
- b. Go to step 4.
- OR:
- a. Press KEY #7 (EXIT) to exit from and end the program.
- OR:
- a. Press KEY #8 (HELP) to view more complete descriptions of the keys used in this step.
42. When Which plotter is being used: 7225/9872? is displayed:
- a. Enter the first character of the plotter designating number; e.g., 7 for the HP 7225, 9 for the HP 9872, etc. Then press **END LINE**.
43. When Enter plotter address or press **END LINE** for AUTO-SCAN? is displayed:
- a. Ensure that the plotter is connected to the computer and turned on.
- b. Enter the plotter address, followed by **END LINE**. (Refer to the plotter user's manual for its address. A typical peripheral plotter address is 705.)
- OR:
- b. Press **END LINE** to cause the computer to scan for and locate the current plotter address.
- Note: If plotter cannot be found, press **CONT** and return to step 41.
44. When Prepare the plotter and press **CONT** is displayed:
- a. Ensure that there is paper in the plotter and that correct pen color is installed.
- b. Press **CONT** to continue.
45. The program prompts for each line, giving the title and the number of (x, y) data points in the line. When First point to graph? (Default is point 1) is displayed:
- a. Press **END LINE** to begin the graph with the first data point.
- OR:
- a. Enter the number (1, 2, 3, etc.) of the first data point to be graphed, followed by **END LINE**.
46. When Last point to graph? (Default is (final point) ) is displayed:
- a. Press **END LINE** to end the graph with the final data point available.
- b. Repeat steps 45 and 46 for each line.
- c. When graph is completed, press **KEY LABEL** to see the special key functions again.
- d. Go to step 41.
- OR:
- a. Enter the number (2, 9, 21, etc.) of the last data point to be graphed, followed by **END LINE**.
- b. Repeat steps 45 and 46 for each line.
- c. When graph is completed, press **KEY LABEL** to see the special key functions again.
- d. Go to step 41.
47. When Enter file name: (Press **END LINE** for catalog)? is displayed:



- a. Press **END LINE** to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.

OR:

- a. Enter the name under which you want the converted IMPac file for this chart stored on the tape cartridge or disc. Then press **END LINE**.
- b. Go to step 41.

OR:

- b. Go to next step if the selected file name already exists on the mass storage device.

48. When File name (file name) already exists. Select option: is displayed:

- a. Enter O **END LINE** to overwrite the old file with the new data.
- b. Go to step 41.

OR:

- a. Enter R **END LINE** to rename the file.
- b. Go to step 47.

OR:

- a. Enter C **END LINE** to cancel the store operation.
- b. Go to step 41.

49. The program permits you to edit, alter, or correct the graph before plotting. When Select option: is displayed and the keys are labeled:

```

DATA PENCOLOR EXIT HELP
 LEGENDS AXES TITLES
```

- a. Press KEY #1 (DATA) to edit the (x, y) data used in the graph.
- b. Go to step 50.

OR:

- a. Press KEY #2 (LEGENDS) to edit the line legends.
- b. Go to step 54.

OR:

- a. Press KEY #3 (AXES) to edit the units and scaling parameters used for the X-axis and the Y-axis.

- b. Go to step 14.

OR:

- a. Press KEY #4 (TITLES) to edit the chart and axes titles.

- b. Go to step 32.

OR:

- a. Press KEY #6 (PENCOLOR) to edit pen colors used for plotting the lines.

- b. Go to step 55.

OR:

- a. Press KEY #7 (EXIT) to exit from the editing options back to the plotting options.

- b. Go to step 41.

OR:

- a. Press KEY #8 (HELP) to view more complete descriptions of the keys used in this step.

50. When Line # for data edit? is displayed:

- a. Enter the line number (1-6) of the line of (x, y) data points you wish to edit, followed by **END LINE**.

51. When Point # for data edit? is displayed:

- a. Enter the point number of the (x, y) point you wish to edit, followed by **END LINE**.

52. The program displays the line number, point number, and X and Y coordinates. When X-coordinate, Y-coordinate: ? is displayed, the X- and Y-coordinates are shown with the cursor on the next line. You can:

- a. Press **END LINE** to proceed without altering the data point.

OR:

- a. Enter the new data, followed by **END LINE**. X-coordinate is to the left of the comma, Y-coordinate is to the right.
53. When Edit another point (Y/ND)? is displayed:
- a. Press **END LINE** if you do not wish to edit another (x, y) data point.
  - b. Go to step 49.
- OR:
- a. Enter Y **END LINE** if you wish to edit another data point.
  - b. Go to step 50.
54. When Line # for new legend? is displayed:
- a. Enter the line number (1-6) of the line whose legend you want to edit, followed by **END LINE**.
  - b. Go to step 9.
55. When Line # for new pen color? is displayed:
- a. Enter the line number (1-6) of the line whose pen color you want to edit, followed by **END LINE**.
  - b. Go to step 13.



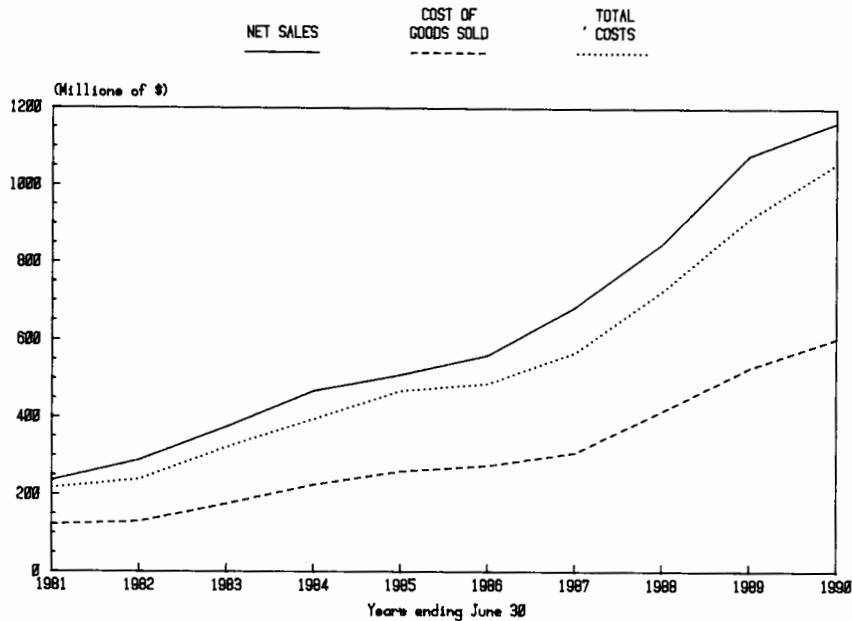
**Example.** Using the data shown here for the XYZ Corporation, plot the lines for projections of net sales, costs of goods sold, and total costs for the years 1981-1990.

XYZ CORPORATION  
TEN-YEAR EARNINGS FORECAST  
(Millions excl. share amts)

| Years ending June 30  | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|
| NET SALES . . . . .   | 236  | 288  | 374  | 468  | 510  | 561  | 684  | 849  | 1078 | 1164 |
| COSTS AND EXPENSES: . |      |      |      |      |      |      |      |      |      |      |
| COST OF GOODS SOLD    | 123  | 130  | 176  | 225  | 260  | 275  | 308  | 416  | 528  | 605  |
| RESEARCH & DEVELOP    | 19   | 26   | 34   | 35   | 41   | 50   | 62   | 72   | 86   | 93   |
| MARKETING & SALES     | 42   | 49   | 64   | 80   | 97   | 95   | 110  | 136  | 172  | 198  |
| GENERAL & ADMIN .     | 33   | 35   | 49   | 56   | 71   | 67   | 89   | 102  | 129  | 163  |
| TOTAL . . . . .       | 217  | 239  | 322  | 395  | 469  | 488  | 568  | 726  | 916  | 1059 |

## XYZ CORPORATION

### Ten-Year Forecast, Sales & Costs



## Curve Fitting

The IMCURV program permits the data in a single IMPac data file to be fitted to up to four standard curves:

- Straight lines (linear regression);  $y=a+bx$ .
- Exponential curves;  $y=ae^{bx}$  ( $a > 0$ ).
- Logarithmic curves;  $y=a+b\ln(x)$ .
- Power curves;  $y=ax^b$  ( $a > 0$ ).

The type of curve fit is specified after data is read from an IMPac data file or converted IMPac data file. Any curve can be specified by pressing the desired key.

The data is entered from an IMPac data file on disc. The program is designed for a maximum of 250 data pairs. The data which has been entered can then be plotted, but not edited.

Once the curve fit has been selected, the regression values will be calculated. The coefficient of determination,  $r^2$ , indicates the quality of fit achieved by the regression. Values of  $r^2$  close to 1.00 indicate a better fit than values close to zero. The regression coefficients,  $a$  and  $b$ , define the curve generated, according to the equations shown above.

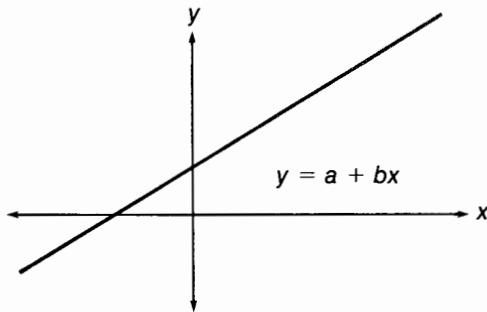
After the analysis of variance has been calculated and printed, you can plot the regression curve over the data.

The analysis of variance which is generated for each regression type prints the following values:

- Degrees of freedom
- Sum of squares
- Mean sum
- F-ratio
- $r^2$

The value of the F-ratio is set to 999.9 if it is greater than 999.9. Therefore if the  $r^2$  value is close or equal to 1, the value of the F-ratio will be printed as 999.9.

### Linear Regression



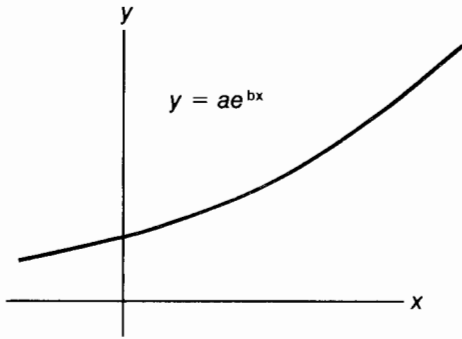
$$b = \frac{\sum x_i y_i - \frac{\sum x_i \sum y_i}{n}}{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}$$

$$a = \left[ \frac{\sum y_i}{n} - b \frac{\sum x_i}{n} \right]$$

$$r^2 = \frac{\left[ \sum x_i y_i - \frac{\sum x_i \sum y_i}{n} \right]^2}{\left[ \sum x_i^2 - \frac{(\sum x_i)^2}{n} \right] \left[ \sum y_i^2 - \frac{(\sum y_i)^2}{n} \right]}$$

Negative and zero values of  $x_i$  will cause an error to be displayed for logarithmic curve fits. Negative and zero values of  $y_i$  will cause an error to be displayed for exponential curve fits. For power curve fits both  $x_i$  and  $y_i$  must be positive, non-zero values.

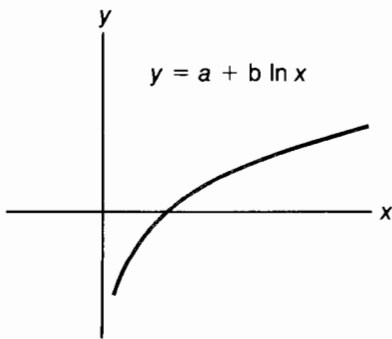
As the differences between  $x$  and/or  $y$  values become small, the accuracy of the regression coefficients will decrease.

**Exponential Curve Fit**

$$b = \frac{\sum x_i \ln y_i - \frac{1}{n} (\sum x_i)(\sum \ln y_i)}{\sum x_i^2 - \frac{1}{n} (\sum x_i)^2}$$

$$a = \exp \left[ \frac{\sum \ln y_i}{n} - b \frac{\sum x_i}{n} \right]$$

$$r^2 = \frac{\left[ \sum x_i \ln y_i - \frac{1}{n} \sum x_i \sum \ln y_i \right]^2}{\left[ \sum x_i^2 - \frac{(\sum x_i)^2}{n} \right] \left[ \sum (\ln y_i)^2 - \frac{(\sum \ln y_i)^2}{n} \right]}$$

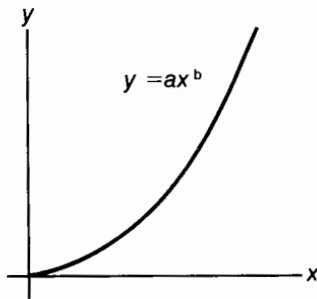
**Logarithmic Curve Fit**

$$b = \frac{\sum y_i \ln x_i - \frac{1}{n} \sum \ln x_i \sum y_i}{\sum (\ln x_i)^2 - \frac{1}{n} (\sum \ln x_i)^2}$$

$$a = \frac{1}{n} (\sum y_i - b \sum \ln x_i)$$

$$r^2 = \frac{\left[ \sum y_i \ln x_i - \frac{1}{n} \sum \ln x_i \sum y_i \right]^2}{\left[ \sum (\ln x_i)^2 - \frac{1}{n} (\sum \ln x_i)^2 \right] \left[ \sum y_i^2 - \frac{1}{n} (\sum y_i)^2 \right]}$$

### Power Curve Fit



$$b = \frac{\sum(\ln x_i)(\ln y_i) - \frac{(\sum \ln x_i)(\sum \ln y_i)}{n}}{\sum(\ln x_i)^2 - \frac{(\sum \ln x_i)^2}{n}}$$

$$a = \exp \left[ \frac{\sum \ln y_i}{n} - b \frac{\sum \ln x_i}{n} \right]$$

$$r^2 = \frac{\left[ \sum(\ln x_i)(\ln y_i) - \frac{(\sum \ln x_i)(\sum \ln y_i)}{n} \right]^2}{\left[ \sum(\ln x_i)^2 - \frac{(\sum \ln x_i)^2}{n} \right] \left[ \sum(\ln y_i)^2 - \frac{(\sum \ln y_i)^2}{n} \right]}$$

The curve fitting program permits you to specify a chart title, a chart subtitle, and a legend for each curve. You can obtain a value for  $\hat{y}$  for each curve, and you have the option of plotting the curve or of calculating the values without plotting. An additional option permits you to treat X-axis data as time intervals (that is, to normalize X-axis data beginning with a value of 1) so that negative, zero, or very large X-axis values do not cause erroneous results.

As with the line chart program, the curve fitting program requires that you know the values of the data; a special option permits review of the raw data in the IMPac data file.

#### File Format for Curve Fitting

In order to use IMCURV, the IMPac data file you create with the PLOT function must contain the (x,y) data points arranged in two rows.

#### User Instructions for Curve Fitting

1. To load the curve fitting program:
  - a. Insert the IMPac program disc.
  - b. Type **LOAD** "IMCURV" **END LINE**.
2. Ensure that an IMPac data file (PLOT) or a converted IMPac data file (i.e., a file that has been stored from the IMPac curve fitting program, and which contains all graphing information in addition to data) is available on the current mass storage device (tape or disc).
3. To start the program, press **RUN**.
4. When [Select I/O]? is displayed:
  - a. Enter I **END LINE** to select an IMPac data file.
  - b. Go to step 5.

OR:

  - b. Enter C **END LINE** to select a converted IMPac data file.
  - c. Go to step 39.

5. When Enter file name with data to fit (Press [END LINE] for catalog?) is displayed:
- Press [END LINE] to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.
- OR:
- Enter the name of the file containing the data points (x, y coordinates) for the line, followed by [END LINE].
6. You can review the data on the file, to help answer later questions on file format, X-axis and Y-axis scaling, values, and labels. When Review data: ... (Select P/D/N)? is displayed:
- Press [END LINE] to continue without reviewing the data.
- OR:
- Enter P [END LINE] to print the data as it is read from the IMPac data file.
  - After the data is printed, press [CONT].
- OR:
- Enter D [END LINE] to display the data as it is read from the IMPac data file.
  - After the data is displayed, press [CONT].
7. When X-axis row (Upper or lower) is displayed:
- Press [END LINE] if the upper row of data is to make up the X-coordinates on the plot.
  - Go to step 8.
- OR:
- Enter L [END LINE] if the lower row of data is to make up the X-coordinates on the plot.
  - Go to step 8.
- OR:
- Enter R [END LINE] if the right-hand column of data is to make up the X-coordinates on the plot.
8. The program returns the number of data points in the specified column or row. When First point to graph? (Default is point 1) is displayed:
- Press [END LINE] if the first point of the data in the row or column is to be the first point plotted.
- OR:
- Enter number of the data point which is to be the first point plotted, followed by [END LINE].
9. When Last point to graph? (Default is (last point)) is displayed:
- Press [END LINE] if the last point to be plotted is the final point available in the row or column.
- OR:
- Enter number of the data point which is to be the last point plotted, followed by [END LINE].
- Note: If the number of an invalid data point is entered, the program returns to step 8.
10. When Select pen color... Enter 1-4? is displayed:
- Enter 1, 2, 3, or 4, followed by [END LINE], if line is to be plotted with black, red, green, or blue pen color, respectively. (Default pen color is black.)
11. When Grid (Y/N)? is displayed:
- Press [END LINE] if a grid is not to be plotted.
- OR:
- Enter Y [END LINE] if a grid is to be plotted.

12. You must know what data points are contained in the file for this step and the following steps. When Minimum X-axis value? is displayed:
  - a. Enter minimum value to be plotted on the X-axis, followed by **END LINE**.
13. When Maximum X-axis value? is displayed:
  - a. Enter maximum value to be plotted on the X-axis, followed by **END LINE**.
14. When Units between X-axis labels? is displayed:
  - a. Enter value (distance) you want between X-axis labels, followed by **END LINE**.
15. When Units between X-axis tics? is displayed:
  - a. Enter value (distance) between unlabeled tics along X-axis, followed by **END LINE**.
16. When Minimum Y-axis value? is displayed:
  - a. Enter minimum value to be plotted on the Y-axis, followed by **END LINE**.
17. When Maximum Y-axis value? is displayed:
  - a. Enter maximum value to be plotted on the Y-axis, followed by **END LINE**.
18. When Units between Y-axis labels? is displayed:
  - a. Enter value (distance) between Y-axis labels, followed by **END LINE**.
19. When Units between Y-axis tics? is displayed:
  - a. Enter value (distance) between tics along Y-axis, followed by **END LINE**.
20. When Enter chart title (32 char. max.)? is displayed:
  - a. Enter the main title (1-32 characters) for the entire chart, followed by **END LINE**.

OR:

  - a. If no chart title is desired, press **END LINE** and go to step 24.
21. When Slanted label (Y/N)? is displayed:
  - a. Press **END LINE** if the characters in the chart title are not to be slanted.

OR:

  - a. Enter Y **END LINE** if the characters in the chart title are to be slanted.
22. When Enter chart subtitle (32 char. max.)? is displayed:
  - a. Enter the subtitle (1-32 characters) for the chart, followed by **END LINE**.

OR:

  - a. If no subtitle is desired, press **END LINE** and go to step 24.
23. When Slanted label (Y/N)? is displayed:
  - a. Press **END LINE** if the characters in the subtitle are not to be slanted.

OR:

  - a. Enter Y **END LINE** if the characters in the subtitle are to be slanted.
24. When Enter X-axis title (32 char. max.)? is displayed:
  - a. Enter the title (1-32 characters) for the X-axis, followed by **END LINE**.

OR:

  - a. If no X-axis title is desired, press **END LINE** and go to step 26.
25. When Slanted label (Y/N)? is displayed:
  - a. Press **END LINE** if the characters in the X-axis title are not to be slanted.

OR:

  - a. Enter Y **END LINE** if the characters in the X-axis title are to be slanted.
26. When Enter Y-axis title (32 char. max.)? is displayed:
  - a. Enter the title (1-32 characters) for the Y-axis, followed by **END LINE**.



OR:

- a. If no Y-axis title is desired, press **END LINE** and go to step 28.

27. When Slanted label (Y/N)? is displayed:

- a. Press **END LINE** if the characters in the Y-axis title are not to be slanted.

OR:

- a. Enter Y **END LINE** if the characters in the Y-axis title are to be slanted.

28. If X-axis data contains negative, zero, or very large values, regression analyses may be inaccurate or may not even be computed. To avoid this, treat the data as time intervals. When Do you want X-axis data treated as time intervals (Y/N)? is displayed:

- a. Press **END LINE** if you do not want the X-axis data treated as time intervals.

OR:

- a. Enter Y **END LINE** if you want the X-axis data treated as time intervals.

**Note:** Treating X-axis data as time intervals causes the data to be normalized beginning with a value of 1. Thus, if the years 1981 to 1990 were treated as time intervals, 1981 would be computed in the regression analyses as 1, 1982 as 2, etc. The values still *appear* as 1981, 1982, etc., on the plot.

29. The program displays the functions of the special function keys (K1-K8). When Select regression is displayed and the keys are labeled:

```

CONT LOG EXP HELP
LINEAR LOG EXP POWER
```

- a. Press KEY #1 (LINEAR) to obtain the linear regression curve fit.  
b. Go to step 30.

OR:

- a. Press KEY #2 (LOG) to obtain the logarithmic curve fit.

- b. Go to step 30.

OR:

- a. Press KEY #3 (EXP) to obtain the exponential curve fit.

- b. Go to step 30.

OR:

- a. Press KEY #4 (POWER) to obtain the power curve fit.

- b. Go to step 30.

OR:

- a. Press KEY #5 (CONT) to continue without obtaining all four possible curve fits.

- b. Go to step 39.

OR:

- a. Press KEY #8 (HELP) to view more complete descriptions of the keys used in this step.

30. If the curve can be plotted, the current PRINTER IS device generates values for degrees of freedom (DF), sum of squares (SS), mean sum (MS), F-ratio (F) and  $r^2$  (R SQUARE). When Estimate Y (Y/N)? is displayed:

- a. Press **END LINE** if you do not want a Y estimate.

- b. Go to step 32.

OR:

- a. Enter Y **END LINE** if you want a Y estimate.

31. When Enter value of X? is displayed:

- a. Enter the X-value for computing the Y estimate, followed by **END LINE**.

- b. Go to step 30.

32. When Do you want this regression line plotted (Y/N)? is displayed:

- a. Press **END LINE** if you do not want to plot the linear regression line.
- b. Go to step 29.
- OR:
- a. Enter Y **END LINE** if you want the regression line plotted.
- b. Go to step 33.
33. When Select pen color...  
Enter 1-4? is displayed:
- a. Enter 1, 2, 3, or 4, followed by **END LINE**, to select the color of ink (black, red, green, or blue, respectively) for this line. (Default color is black.)
34. When Legend for Line #1 (or Legend for another line) (FIRST 12 char.)? is displayed:
- a. Enter the first portion (1-12 characters) of the desired legend for this line, followed by **END LINE**.
- OR:
- a. If no first portion of legend is desired, press **END LINE** and go to step 38.
35. When Slanted label (Y/N)? is displayed:
- a. Press **END LINE** if the first portion of the legend for this line is not to be slanted when plotted.
- OR:
- a. Enter Y **END LINE** if the first portion of the legend is to be slanted.
36. When Legend for Line #1 (or Legend for another line) (LAST 12 char.)? is displayed:
- a. Enter the last portion (1-12 characters) of the legend for this line, followed by **END LINE**.
- OR:
- a. If no last portion of legend is desired, press **END LINE** and go to step 39.
37. When Slanted label (Y/N)? is displayed:
- a. Press **END LINE** if the final portion of the legend for this line is not to be slanted when plotted.
- b. Go to step 29, or to step 39 if all regressions have been specified.
- OR:
- a. Enter Y **END LINE** if the final portion of the legend for this line is to be slanted.
- b. Go to step 29, or to step 39 if all regressions have been specified.
- Note:** If all the regression values for all four possible curves have been computed, the program displays ALL LINES COMPUTED. Go to step 39.
38. When Enter file name:  
(Press **END LINE** for catalog)? is displayed:
- a. Press **END LINE** to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.
- OR:
- a. Enter the name of a converted IMPac data file, containing data, curves, labels, titles, etc., for an entire graph. then press **END LINE**.
39. The program displays the functions of the special function keys (K1-K8). When Select option is displayed and the keys are labeled:
- ```

-----
PLT-CRT  GET-DAT  EXIT    HELP
PLOTTER  SAV-DAT  LIST    EDIT

```
- a. Press KEY #1 (PLOTTER) to plot the graph on a peripheral plotter.
- b. Go to step 40.
- OR:

- a. Press KEY #2 (SAV-DAT) to save all data, as well as all curves to be plotted (including titles, labels, pen codes, etc.), as a converted IMPac data file on a tape cartridge or disc.

b. Go to step 43.

OR:


- a. Press KEY #3 (LIST) to list all data, titles, labels, etc., for this set of lines.

OR:

- a. Press KEY #4 (EDIT) to re-enter the data values to be plotted, graph titles, axes specifications, or the regression lines to be plotted.

b. Go to step 45.

OR:

- a. Press KEY #5 (PLT-CRT) to obtain an abbreviated plot on the CRT display.
- b. Press  to return the special key functions to the display.

OR:

- a. Press KEY #6 (GET-DAT) to load an IMPac data file or a converted IMPac data file.
- b. Go to step 4.

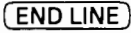
OR:

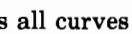
- a. Press KEY #7 (EXIT) to exit from and end the program.


OR:

- a. Press KEY #8 (HELP) to view more complete descriptions of the keys used in this step.


40. When Which plotter is being used: 7225/9872? is displayed:


- a. Enter the first character of the plotter designating number; e.g., 7 for the HP 7225, 9 for the HP 9872, etc. Then press .


41. When Enter plotter address or press  for AUTO-SCAN? is displayed:


- a. Ensure that the plotter is connected to the computer.
- b. Enter the plotter address, followed by . (Refer to the plotter user's manual for its address. A typical peripheral plotter address is 705.)


OR:

- b. Press  to cause the computer to scan for and locate the current plotter address.


42. When Prepare the plotter and press  is displayed:

- a. Ensure that there is paper in the plotter and that the correct color pen is installed.
- b. Press  to continue.
- c. Go to step 39 when plot is completed.

43. When Enter file name: (Press  for catalog)? is displayed:

- a. Press  to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.

OR:

- a. Enter the name under which you want the converted IMPac file for this chart stored on the tape cartridge or disc. Then press: .

b. Go to step 39.

OR:

- b. Go to next step if the selected file name already exists on the mass storage device.

44. When File name (file name) already exists. Select option: is displayed:

- a. Enter O (END LINE) to overwrite the old file with the new data.
- b. Go to step 39.
- OR:
- a. Enter R (END LINE) to rename the file.
- b. Go to step 43.
- OR:
- a. Enter C (END LINE) to cancel the store operation.
- b. Go to step 39.
45. The program permits you to use the special function keys to return to various points in the program to re-enter information before plotting. When Select option is displayed and the keys are labeled:

```
-----
PLOT PT.  AXES  CURVES  HELP
                                CONT
```

- a. Press KEY #1 (PLOT PT.) to re-enter the points you want to graph, and the axes, labels and curves to be computed and plotted on the graph.

- b. Go to step 8.

OR:

- a. Press KEY #2 (AXES) to re-enter axes and labels, and the curves to be computed and plotted on the graph.
- b. Go to step 11.

OR:

- a. Press KEY #3 (CURVES) to re-enter the curves to be computed and plotted on the graph.
- b. Go to step 28.

OR:

- a. Press KEY #4 (CONT) to continue without editing.
- b. Go to step 39.

OR:

- a. Press KEY #8 (HELP) to view more complete descriptions of the keys used in this step.

Example. Using the data here, determine which curve best fits the projected data for net sales for the XYZ corporation. The X-axis data should be treated as time intervals.

```
AOV: LINEAR REGRESSION
SOURCE/DF      SS      MS      F
TOTAL    9 919103.6
REG      1 871230.1871230.1 145.6
RESID    8 47873.5 5984.2
R SQUARE =          0.948
```

```
REGRESSION COMPUTED WITH
1980 = 1
```

```
YHAT=-.4676E+002 +1.0276E+002 X
```

```

      ANV: LOGARITHMIC REGRESSION
SOURCE/DF      SS      MS      F
TOTAL      9 919103.6
REG        1 755446.7755446.7  36.9
RESID      8 163656.9 20457.1
R SQUARE =          0.822

```

```

REGRESSION COMPUTED WITH
1980 = 1

```

YHAT=-.293E+003+5.225E+002LOG(X)

```

      ANV: EXPONENTIAL REGRESSION
SOURCE/DF      SS      MS      F
TOTAL      9      2.6
REG        1      2.5      2.5 693.6
RESID      8      0.0      0.0
R SQUARE =          0.989

```

```

REGRESSION COMPUTED WITH
1980 = 1

```

YHAT=1.756E+002EXP(1.754E-001 X)

```

      ANV: POWER REGRESSION
SOURCE/DF      SS      MS      F
TOTAL      9      2.6
REG        1      2.4      2.4 166.3
RESID      8      0.1      0.0
R SQUARE =          0.954

```

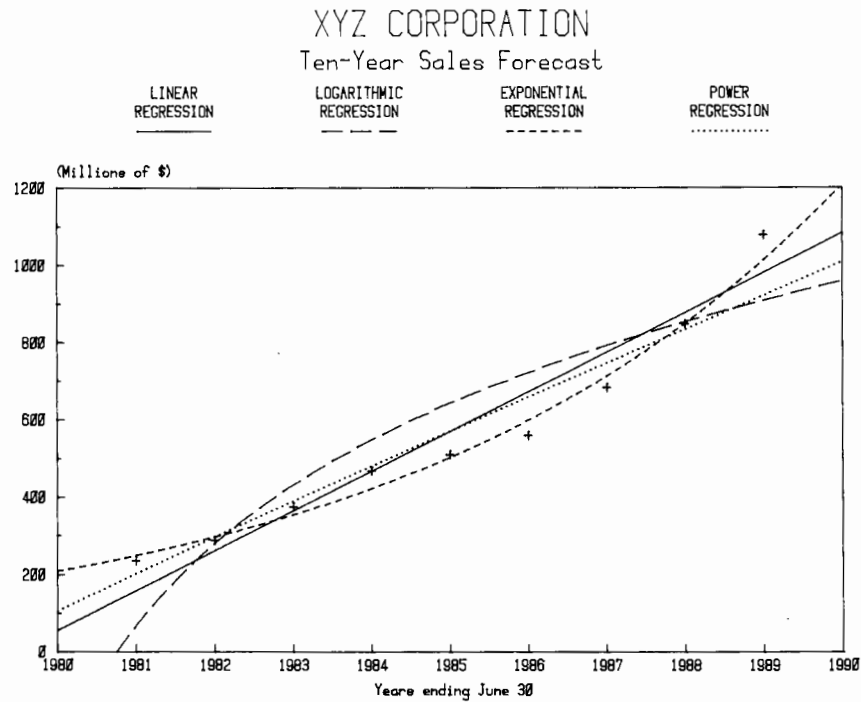
```

REGRESSION COMPUTED WITH
1980 = 1

```

YHAT=1.0579E+002X ^ 9.4066E-001

As you can see from the values for r^2 , the curve which best fits the projected sales data is the exponential curve.



Pie Charts

The IMPIE program permits the data in an IMPac data file or a converted IMPac data file to be used to create pie charts. From a single file, you can plot one pie; if two files exist, two pies may be plotted on the same sheet. Each pie may contain a minimum of two and a maximum of 25 slices.

Each IMPIE slice may be specified in any of four pen colors. In addition, you can specify one of six different shadings (hatchings) for a slice, and you can plot the slice as normal or exploded. Another option allows you to label each slice with the percentage it is of the entire pie.

File Format for Pie Charts

In order to use IMPIE, each IMPac data file you create with the PLOT function must be made up of two sets of data:

- Labels for slices.
- Data for slices.

User Instructions for Pie Charts

1. Insert the IMPac program disc.
2. To load the pie chart program:
 - a. Type `LOAD` "IMPIE" `END LINE`.
3. Ensure that a suitable IMPac data file (PLOT) or a converted IMPac data file (i.e., a file that has been stored from the pie chart program, and which contains all graphing information in addition to data) is available on the current mass storage device (tape or disc).
4. To start the program, press `RUN`.
5. When `[Select I/C]?` is displayed:
 - a. Enter I `END LINE` to select an IMPac data file.
 - b. Go to step 6.
 OR:
 - a. Enter C `END LINE` to select a converted IMPac file.
 - b. Go to step 16.
6. When `Enter number of pies (1 or 2)?` is displayed:
 - a. Enter 1 `END LINE` to plot single pie.
 OR:
 - a. Enter 2 `END LINE` to plot two pies.
7. When `Enter data file name for pie # 1: or Enter data file name for pie # 2: (Press [END LINE] for catalog)?` is displayed:
 - a. Press `END LINE` to see a catalog of the files available on the current storage device. This catalog is generated by the PRINTER IS device.
 OR:
 - a. Enter the file name of the PLOT file that contains the pie chart data, then press: `END LINE`.

Note: If the IMPac data file (PLOT) will produce fewer than two slices, or if the file you have selected is not a PLOT file, the program displays: PROGRAM ENDED. Press the `RUN` key to restart the program.

OR:

- a. Enter C `END LINE` if the data file is arranged in two columns.
 - b. Go to step 7 for a second pie.
8. For each slice, the program displays the value and the label. When `Slanted label (Y/N)?` is displayed:
 - a. Press `END LINE` if the label is not to be slanted.
 OR:
 - a. Enter Y `END LINE` if the label is to be slanted.
 9. When `Select pen color: ... Enter 1-4?` is displayed:
 - a. Enter 1, 2, 3 or 4 `END LINE` to select the pen color (black, red, green, or blue, respectively) of the label. (Default color is black, or the underlined code if editing.)
 10. When `Select hatch code: ... Enter 1-6?` is displayed:
 - a. Enter 1, 2, 3, 4, 5 or 6, followed by `END LINE`, to select the type of hatching for the pie slice. (Default is no hatching, or the underlined code if editing.)
 11. You may cause any or all slices to be exploded (set off) from each pie. When `Exploded slice (Y/N)?` is displayed:
 - a. Press `END LINE` if the slice is to be part of the pie.

- OR:
- a. Enter Y (END LINE) if the slice is to be exploded from the pie.
 - b. Go to step 9 for next slice.
- OR:
- b. Go to step 12 if all slices have been specified.
12. When Pie # 1 subtitle label (32 char. max.)? or Pie # 2 subtitle label (32 char. max.)? is displayed:
- a. Enter the subtitle (1 to 32 characters) for the pie, followed by (END LINE).
- OR:
- a. If no subtitle is desired, press (END LINE) and go to step 15.
- OR:
- a. If plotting a second pie, go to step 9.
13. When Slanted label (Y/N)? is displayed:
- a. Press (END LINE) if the pie subtitle is not to be slanted.
 - b. Go to step 9 if this was the first of two pies.
- OR:
- a. Enter Y (END LINE) if pie subtitle is to be slanted.
 - b. Go to step 9 if this was the first of two pies.
14. When Chart title label (32 char. max.)? is displayed:
- a. Enter the overall title (1-32 characters) for the entire chart, followed by (END LINE).
- OR:
- a. If no chart title is desired, press (END LINE) and go to step 17.
15. When Slanted label (Y/N)? is displayed:
- a. Press (END LINE) if the chart title is not to be slanted.
 - b. Go to step 17.
- OR:
- a. Enter Y (END LINE) if the chart title is to be slanted.
 - b. Go to step 17.
16. When Enter file name: (Press [END LINE] for catalog)? is displayed:
- a. Press (END LINE) to see a catalog of the files available on the current storage device. This catalog is generated by the PRINTER IS device.
- OR:
- a. Enter the file name of the converted IMPac data file (i.e., a file which contains pie chart data as well as hatch and slant codes, pen colors, number of pies, etc.), followed by (END LINE).
17. The program displays the functions of the special function keys (K1-K8). When the keys are labeled:
- ```

PLT-FST GET-DAT PLT-CRT HELP
PLT-FNL SAV-DAT LIST EXIT

```
- a. Press KEY #1 (PLT-FNL) to obtain a final plot. This option will cause a complete plot with all hatching.
  - b. Go to step 20.
- OR:
- a. Press KEY #2 (SAV-DAT) to save data, labels, slice labels, and hatch and slant codes as converted IMPac data file on a mass storage device.
  - b. Go to step 18.
- OR:
- a. Press KEY #3 (LIST) to see a list of the titles, labels, slice labels and hatch and slant codes. This list is generated by the current PRINTER IS device.
- OR:
- a. Press KEY #4 (EXIT) to exit from and end the program.



OR:

- a. Press KEY #5 (PLT-FST) to obtain a fast plot. This option will cause each pie to be plotted more rapidly than a final plot, and with no hatching.
- b. Go to step 20.

OR:

- a. Press KEY #6 (GET-DAT) to load an IMPac data file or a converted IMPac data file or to edit the current pie specifications.
- b. Go to step 24.

OR:

- a. Press KEY #7 (PLT-CRT) to obtain an abbreviated plot on the current CRT display.
- b. Press **KEY LABEL** to return the key functions to the display.

OR:

- a. Press KEY #8 (HELP) to view more complete descriptions of the functions of the keys used in this step.

18. When Enter file name:  
(Press [END LINE] for  
catalog)? is displayed:

- a. Press **END LINE** to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.

OR:

- a. Enter the name under which you want the converted IMPac data file stored on the disc, followed by **END LINE**.
- b. Go to step 17.

OR:

- b. Go to next step if the selected file name already exists on the mass storage device.

19. When File name (file name)  
already exists. Select  
option: is displayed:

- a. Enter O **END LINE** to overwrite the old file with new data.
- b. Go to step 17.

OR:

- a. Enter R **END LINE** to rename the file.
- b. Go to step 18.

OR:

- a. Enter C **END LINE** to cancel the store operation.
- b. Go to step 17.

20. When Enter plotter address  
or press [END LINE] for  
AUTO-SCAN? is displayed:

- a. Ensure that the plotter is connected to the computer.
- b. Enter the plotter address, followed by **END LINE**. (See the user's manual for the plotter for its address. A typical peripheral plotter address is 705.)

OR:

- b. Press **END LINE** to allow the computer to locate the current plotter address.

21. When Which plotter is  
being used: 7225/9872? is  
displayed:

- a. Enter the first number of the plotter designating number; e.g., 7 for the HP 7225, 9 for the HP 9872, etc. Then press **END LINE**.

22. When Do you wish to have  
the percentages labeled  
(Y/N)? is displayed:

- a. Enter Y **END LINE** if you want each slice labeled to show the percentage it is of the complete pie.

OR:

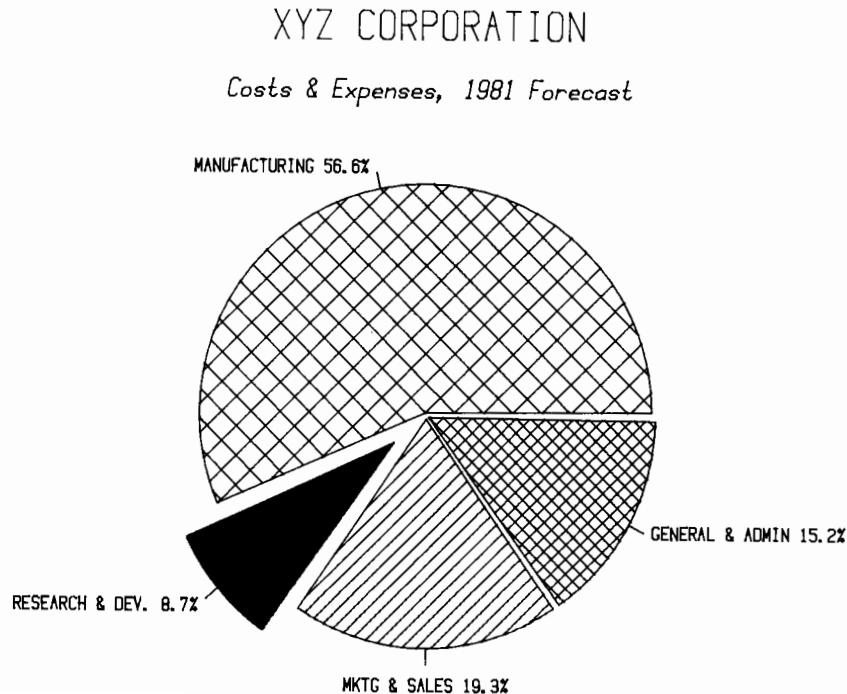
- a. Press **END LINE** if you do not want the slices labeled with percentages.

Note: Percentage values are truncated (not rounded) to one decimal place.

23. When Prepare the plotter and press [CONT] is displayed:
- Ensure that there is paper in the plotter and that the correct color of pen is installed.
  - Press [CONT] to continue.
  - Follow the instructions displayed for the specific plotter.
  - Go to step 17 when the plot has been completed.
24. When Do you want to edit (Y/N)? is displayed:
- Press [END LINE] to load an IMPac data file or a converted IMPac data file.
- Go to step 5.
- OR:
- Enter Y [END LINE] to edit the current pie specifications.
25. When Edit slice specifications (Y/N)? is displayed:
- Press [END LINE] to edit the pie and chart titles only.
  - Go to step 12.
- OR:
- Enter Y [END LINE] to edit the slice specifications.
  - Go to step 8.

**Example.** Use the data below for the XYZ Corporation to show the proportions of total costs and expenses for the year 1981.

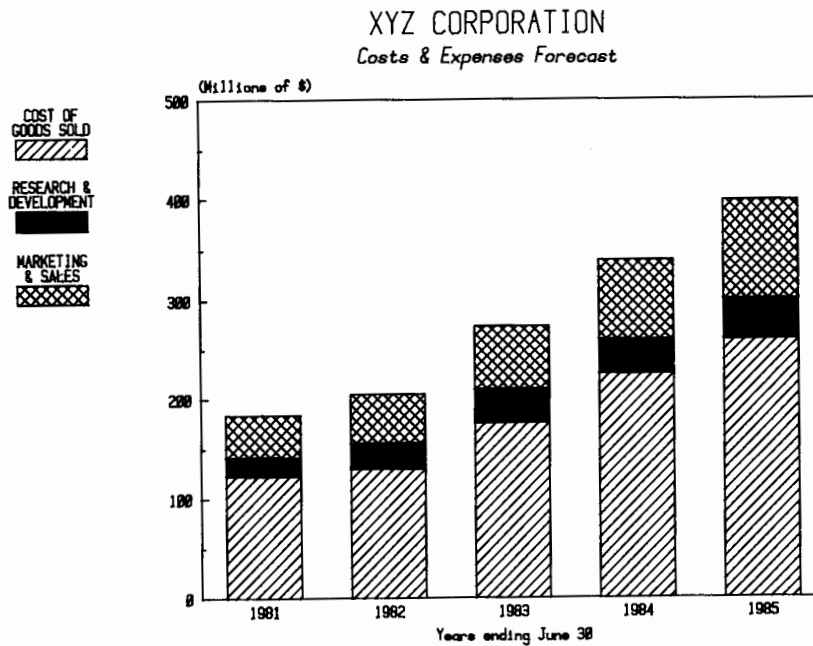
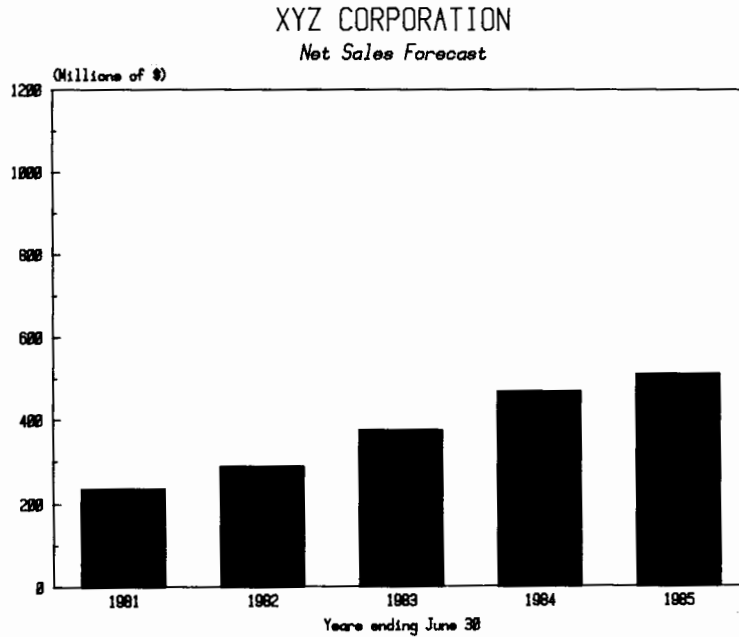
```
NET SALES:$236
COST OF GOODS SOLD:$123
R AND D:$19
MKT AND SALES:$42
GENERAL AND ADMIN:$33
```

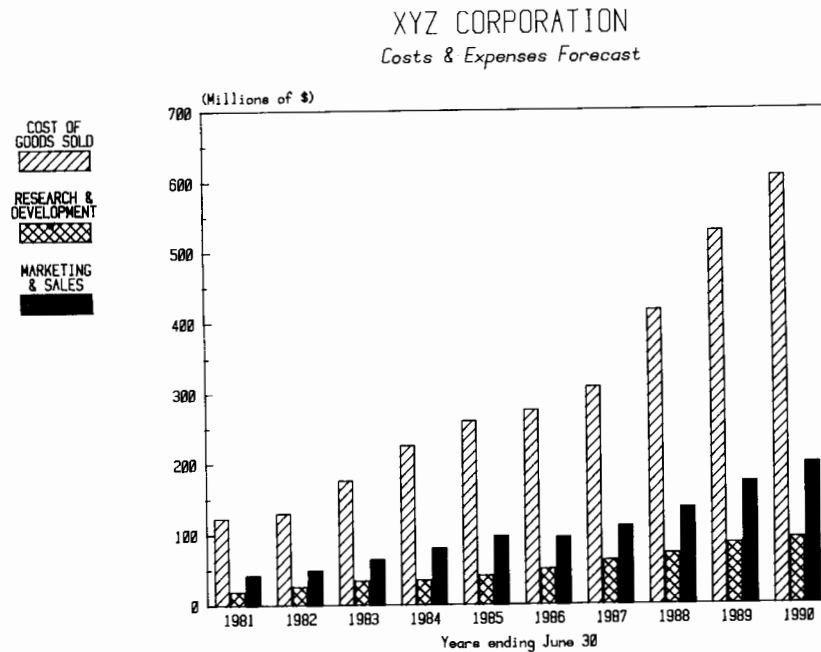


## Bar Charts

The "IMBAR" program permits the data in an IMPac data file or a converted IMPac data file to be used to create a bar chart. From a single IMPac data file you can plot from one to 25 bars. Bars may also be stacked or clustered; a single cluster or stack may contain a bar from each of up to six IMPac data files.

When plotting bars, you have the option of any of four pen colors, and any of six shading (hatching) options. These plotting options, along with the upright or slanted legends, make it easy to identify the bars in a cluster or stack.





### File Format for Bar Charts

In order to use "IMBAR," each IMPac data file you create with the PLOT function must be made up of a single set of numbers.

In order to create a graph of 10 clusters, with three bars in each cluster, you would need three PLOT files available, and each file would have to be made up of a single set of 10 data points.

### User Instructions for Bar Charts

1. Insert the IMPac program disc.
2. To load the bar chart program:
  - a. Type `LOAD "IMBAR" END LINE`.
3. Ensure that a suitable IMPac data file (PLOT) or a converted IMPac data file (i.e., a file that has been stored from the bar chart program, and which contains all graphing information in addition to data) is available on the current mass storage device (tape or disc).
4. To start the program, press `RUN`.
5. When `(Select I/C)?` is displayed:
  - a. Enter `I END LINE` to select an IMPac data file.
  - b. Go to step 6.
- OR:
- a. Enter `C END LINE` to select a converted IMPac file.
- b. Go to step 24.
6. When `Select type of bar chart... Select option (N/S/C)?` is displayed:
  - a. Enter `N END LINE` to specify a normal (single) bar chart.
  - b. Go to step 8.
- OR:
- a. Enter `S END LINE` to specify stacked bars.
- b. Go to step 7.

OR:

- a. Enter C (END LINE) to specify clustered bars.
- b. Go to step 7.

7. When Enter the number of bars in each stack/  
cluster 1-6? is displayed:

- a. Enter the number of bars, from one to six, that will be plotted in each stack or cluster. Then press (END LINE).

8. When Enter file name for legend # 1: (Press [END LINE] for catalog)? or Enter file name for (another legend) is displayed:

- a. Press (END LINE) to see a catalog of the files contained on the current storage medium. This catalog is generated by the current PRINTER IS device.

OR:

- a. Enter the file name of the legend for the first file of bars. Then press (END LINE).
- b. Go to next step.

OR:

- b. Go to step 12 for normal bars.

9. When Label for legend (FIRST 12 char.)? is displayed:

- a. Enter the first portion (1-12 characters) of the label you want to appear with the legend for this file of bars. Then press (END LINE).

OR:

- a. If no label is desired for this legend, press (END LINE).

10. When Label for legend (LAST 12 char.)? is displayed:

- a. Enter the final portion (1-12 characters) of the label you want to appear with the legend for this file of bars. Then press (END LINE).

OR:

- a. If no label is desired for this legend, press (END LINE) and go to step 12.

11. When Slanted label (Y/N)? is displayed:

- a. Press (END LINE) if the label for this legend is not to be slanted when plotted.

OR:

- a. Enter Y (END LINE) if the label for this legend is to be slanted.

12. When Select pen color... Enter 1-4? is displayed:

- a. Enter 1, 2, 3 or 4, followed by (END LINE), to select the color of ink (black, red, green, or blue, respectively) for this file of bars. (Default color is black, or the underlined code if editing.)

13. When Select hatch code: Enter 1-6? is displayed:

- a. Enter 1, 2, 3, 4, 5 or 6, followed by (END LINE), to select the type of hatching for this file of bars. (Default is hatch code of current legend, which is underlined.)
- b. Go to step 8 for another file of bars if data is being entered for the first time.

OR:

- b. Go to step 9 if editing.

OR:

- b. Go to step 14 if all files of bars have been specified.

OR:

- b. Go to step 36 if all files of bars have been edited.

14. When Enter chart title (32 char. max.)? is displayed:

- a. Enter the main title (1-32 characters) for the entire chart, followed by (END LINE).

OR:

- a. If no chart title is desired, press (END LINE) and go to step 16.

15. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the chart title are not to be slanted.
- OR:
- Enter Y **END LINE** if the characters in the chart title are to be slanted.
16. When Enter chart subtitle (32 char. max.)? is displayed:
- Enter the subtitle (1-32 characters) for the chart, followed by **END LINE**.
- OR:
- If no chart subtitle is desired, press **END LINE** and go to step 18.
17. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the subtitle are not to be slanted.
- OR:
- Enter Y **END LINE** if characters are to be slanted.
18. When Enter Y-axis title (32 char. max.)? is displayed:
- Enter the title (1-32 characters) for the Y-axis, followed by **END LINE**.
- OR:
- If no Y-axis title is desired, press **END LINE** and go to step 20.
19. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the Y-axis title are not to be slanted.
  - Go to step 20.
- OR:
- Enter Y **END LINE** if the characters in the Y-axis title are to be slanted.
20. When Enter X-axis title (32 char max.)? is displayed:
- Enter the title (1-32 characters) for the X-axis, followed by **END LINE**.
- OR:
- If no X-axis title is desired, press **END LINE** and go to step 22.
21. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if the characters in the X-axis title are not to be slanted.
- OR:
- Enter Y **END LINE** if the characters in the X-axis titles are to be slanted.
22. When Enter X-axis labels: Label # 1 (or another label #) is displayed:
- Enter the label (1-20 characters) for the specified position of a normal bar, or for a stack or cluster of bars. Then press **END LINE**.
- OR:
- If no label is desired, press **END LINE**.
- OR:
- Alter the previous label to fit this position, then press **END LINE**.
  - Go to step 25 if all labels have been specified.
23. When Slanted label (Y/N)? is displayed:
- Press **END LINE** if this label is not to be slanted when plotted.
  - Return to step 22 for another label.
- OR:
- Go on to step 25 if all X-axis positions have been labeled.
- OR:
- Enter Y **END LINE** if this label is to be slanted.
  - Return to step 22 for another label.
- OR:
- Go on to step 25 if all X-axis positions have been labeled.

24. When Enter file name:  
(Press [END LINE] for  
catalog)? is displayed:
- Press **[END LINE]** to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.

OR:

- Enter the name of a converted IMPac data file, containing data, labels, titles, pen codes, etc. for all bars (including clusters or stacks) on a single graph. Then press **[END LINE]**.

25. The program displays the functions of the special function keys (K1-K8). When Select option and the following key labels are displayed:

```

PLT-FST GET-DAT PLT-CRT HELP
PLT-FNL SAV-DAT LIST EXIT
```

- Press KEY #1 (PLT-FNL) to generate a final plot, with all hatching, on a peripheral plotter.
- Go to step 26.

OR:

- Press KEY #2 (SAV-DAT) to save all data, as well as all titles, labels, pen codes, etc., as a converted IMPac data file on a tape cartridge or disc.
- Go to step 32.

OR:

- Press KEY #3 (LIST) to list all data, titles, labels, etc., for this set of bars.

OR:

- Press KEY #4 (EXIT) to exit from and end the program.

OR:

- Press KEY #5 (PLT-FST) to obtain an abbreviated plot, without hatching, on a peripheral plotter.
- Go to step 26.

OR:

- Press KEY #6 (GET-DAT) to load an IMPac data file or a converted IMPac data file, or to edit the current bar specifications.
- Go to step 34.

OR:

- Press KEY #7 (PLT-CRT) to obtain an abbreviated plot on the CRT display.
- Press **[KEY LABEL]** to return the special key functions to the display.

OR:

- Press KEY #8 (HELP) to view more complete descriptions of the functions of the keys used in this step.

26. When Enter plotter address  
or press [END LINE] for  
AUTO-SCAN? is displayed:

- Ensure that the plotter is connected to the computer.
- Enter the plotter address. (Refer to the plotter user's manual for its address. A typical peripheral plotter address is 705.) Then press **[END LINE]**.

OR:

- Press **[END LINE]** to cause the computer to scan for and locate the current plotter address.

Note: If plotter cannot be found, press **[CONT]** and return to step 25.

27. When Minimum Y-axis value?  
is displayed:

- Enter the minimum value to be graphed along the Y-axis, followed by **[END LINE]**.

28. When Maximum Y-axis value?  
is displayed:

- Enter the maximum value to be graphed along the Y-axis, followed by **[END LINE]**.

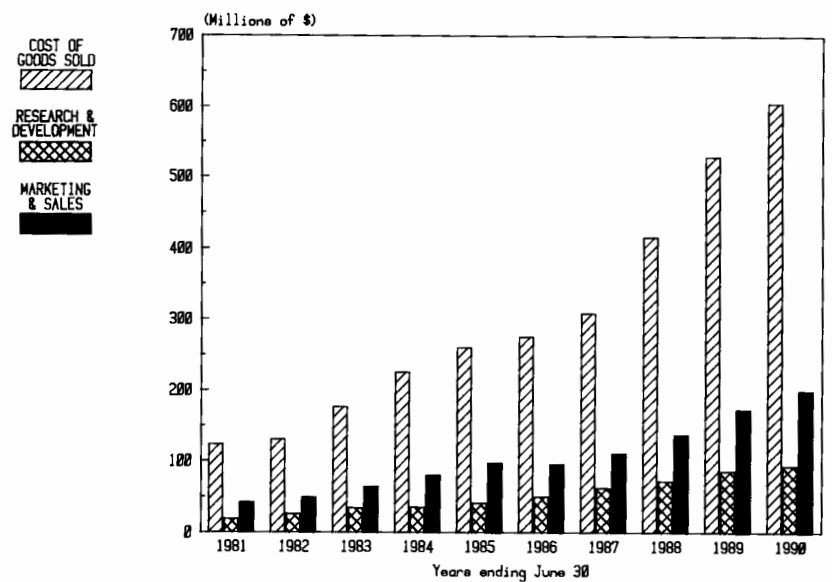
29. When Units between Y-axis labels? is displayed:
- Enter the increment (distance) you want between each label on the Y-axis, followed by **END LINE**.
  - Go to step 30 if plotting on a peripheral plotter.
- OR:
- Go to step 25 if this was a plot on the CRT display.
30. When Which plotter is being used: 7225/9872? is displayed:
- Enter the first character of the plotter designating number; e.g., 7 for the HP 7225, 9 for the HP 9872, etc. Then press **END LINE**.
31. When Prepare the plotter and press [CONT] is displayed:
- Ensure that there is paper in the plotter and that the proper color of pen is installed.
  - Press **CONT** to continue.
  - When the plot is finished, go to step 25.
32. When Enter file name: (Press [END LINE] for catalog)? is displayed:
- Press **END LINE** to see a catalog of the files available on the current mass storage device. This catalog is generated by the current PRINTER IS device.
- OR:
- Enter the name under which you want the converted IMPac file for this chart stored on the disc. Then press **END LINE**.
  - Go to step 25.
- OR:
- Go to next step if the selected file name already exists on the current mass storage device.
33. When File name (file name) already exists. Select option: is displayed:
- Enter O **END LINE** to overwrite the old file with new data.
  - Go to step 25.
- OR:
- Enter R **END LINE** to rename the file.
  - Go to step 32.
- OR:
- Enter C **END LINE** to cancel the store operation.
  - Go to step 25.
34. When Do you want to edit (Y/N)? is displayed:
- Press **END LINE** to load an IMPac data file or a converted IMPac data file.
  - Go to step 5.
- OR:
- Enter Y **END LINE** to edit the current bar specifications.
35. When Edit legend specifications (Y/N)? is displayed:
- Press **END LINE** if the legend specifications are not to be edited.
  - Go to step 36.
- OR:
- Enter Y **END LINE** to edit the legend specifications.
  - Go to step 9.
36. When Edit titles & axes labels (Y/N)? is displayed:
- Press **END LINE** if the titles and axes labels are not to be edited.
  - Go to step 25.
- OR:
- Enter Y **END LINE** to edit the titles and axes labels.
  - Go to step 14.



**Example.** Use the projected XYZ Corporation data below to generate a clustered bar graph that shows costs of goods sold, research and development, and marketing and sales from 1981 through 1990.

| Years ending June 30  | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|
| NET SALES . . . . .   | 236  | 288  | 374  | 468  | 510  | 561  | 684  | 849  | 1078 | 1164 |
| COSTS AND EXPENSES: . |      |      |      |      |      |      |      |      |      |      |
| COST OF GOODS SOLD    | 123  | 130  | 176  | 225  | 260  | 275  | 308  | 416  | 528  | 605  |
| RESEARCH & DEVELOP    | 19   | 26   | 34   | 35   | 41   | 50   | 62   | 72   | 86   | 93   |
| MARKETING & SALES     | 42   | 49   | 64   | 80   | 97   | 95   | 110  | 136  | 172  | 198  |

XYZ CORPORATION  
Costs & Expenses Forecast



**Notes**

# HELPER: Obtaining Real-Time Help From IMPac

## Introduction

HELPER is an IMPac program that allows you to obtain additional information about the operation of IMPac without requiring reference to this manual. HELPER can be executed by either pressing the HELPER function key in the program menu, or by entering `(RUN) "HELPER" (END LINE)`.

## HELPER Options

When you first begin HELPER, you will be asked to press a function key referring to the program or portion of IMPac you need help with. These portions are as follows:

```
CREATE
UPDATE
SEARCH
```

To select one of these items, press the corresponding function key.

## Tables of Contents and Selections

HELPER will then display a Table of Contents for the function key you selected. Each HELPER file is divided into Sections (denoted by capital numerals) and Chapters (denoted by lower-case roman numerals). Every Section and Chapter has a number assigned to it, and your selections are made using these numbers.

The first item in every Table of Contents is the ALL selection. By entering the number 1 corresponding to ALL, the entire contents of the HELPER file will be displayed and/or printed. Selecting a Section will cause all Chapters within the Section to be printed and/or displayed; selecting an individual Chapter will cause only that Chapter to be printed and/or displayed.

If you select the Display option, you will be asked to press `(CONT)` each time a single display page is filled, and when the Section(s) or Chapter(s) you selected are completely output. If you select the Print option, HELPER will not require you to CONTINUE the program after each 15 lines.

## Ending HELPER

At the end of each HELPER session, you will be returned to the HELPER function key set. To obtain assistance with another program, select a function key that relates to your requirement. If you wish to end the HELPER program, however, press the STOP function key.

## Notes

# IMPac for Advanced Programmers

## Introduction

The Information Management Pac was designed to require no knowledge of computer programming or operation. There are times, however, when the IMPac system cannot provide output in the format desired by the user. In addition, it may be desirable to be able to retrieve records from an IMPac file *without* using an IMPac program. Both of these situations require that the user write a program to "interface" to IMPac. The following section will describe the organization of IMPac Header and Master files, as well as provide examples and cautions.

## IMPac File Structures

IMPac uses, in general, three types of files: Pointer/descriptor (Header), Record (Master) and Scratch (DO, AUX, AUX2, Gate). Each IMPac data set has a unique Header, Master and Gate file associated with it, while the DO, AUX and AUX2 files are shared by all IMPac data sets.

## Header File Structure

Each IMPac Header file contains a minimum of 10 records, of which at least 9 are utilized for storage from the time of Master file initialization. The following is a list of the usage that each record is put to:

| Record # | Usage                                                                                                                                          |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | Master file attributes (size, number of elements, number of records used, location of lowest Ordered Element and first available record, etc.) |
| 2        | Name and MSUS of AUX and Gate files                                                                                                            |
| 3        | Element names (preceded by A N O S)                                                                                                            |
| 4        | Completion of element name list (if needed)                                                                                                    |
| 5        | Storage of 'DO' Formats                                                                                                                        |
| 6        | Completion of storage of 'DO' Formats                                                                                                          |
| 7        | First set of record numbers, in order of ID numbers                                                                                            |
| 8        | First set of deleted record numbers, ordered from earliest to latest deletion                                                                  |
| 9        | First set of record numbers, in order of Ordered Element                                                                                       |

Additional records are utilized as records are added to the Master file. In general, *two* additional Header records (one for each ID order and Ordered Element order list) are needed for every 60 records added to the Master file. Thus, record #10 will hold the continuation of the ID order list, and record #11 will hold the Ordered Element order list.

The first record of the Header File contains the information needed to define the organization of each Master File. The entire record is loaded into the R( ) array used in every IMPac program, with the following correspondences:

| R-Array Number | Meaning                                                 |
|----------------|---------------------------------------------------------|
| 1              | First record available in Master file                   |
| 2              | Record in Master file with lowest-value Ordered Element |
| 3              | Number of elements in Master file records               |
| 4              | Master file size in number of records                   |
| 5              | Number of records used in Master file                   |
| 6-15           | Not used                                                |
| 16             | Ordered Element number                                  |
| 17             | Number of bytes in each Master file record              |
| 18             | First available record in Header file                   |

These values are stored in the first Header file record, in the same order as shown above. Record 2 holds two strings, giving the name and location of scratch files necessary for processing the Master file. Records 3 and 4 hold strings that represent the names of elements defined in the Master file. These names are stored with a prefix denoting whether they represent a Numeric-only, Alphanumeric or Dollars and Cents element. ID is always the first element name stored, and is shown as `NIID`. In the example given in this manual, STATE is stored as `ASTATE`. No Dollars and Cents elements are present in this example, but they would be stored as `"$aaaa."`

Records 5 and 6 contain 'DO' formats that have been defined, stored as strings in the order of their definition. Records 7, 8, 9 and all following are "pointer" records, whose organization can be generalized as follows:

- All data in pointer records are stored as numbers.
- The first value in every pointer record is a pointer to the next Header file record continuing this pointer series. ID, Deleted record and Ordered Element records thus have their own series.
- The remaining values in every pointer record are pointers to records in the Master File, with *one exception* (to be discussed shortly).

When the data set is first initialized, records 7, 8 and 9 have only the number 0 written into them. As records are entered into the Master file, additional numbers are written into records 7 and 9 following the 0. Whenever a record is deleted from the Master file, the record number of this record is written into record 8 following the 0. After approximately 60 records have been added to the Master file, the 0 in records 7 and 9 is changed to the record numbers that the series continue in (usually 10 for ID order and 11 for Ordered Element order).

Deleted records are utilized for Master file storage in last-deleted, first-reused order. There can be times, however, when a sufficient number of records are deleted to require deletion of one or two Header records. When this happens, the record numbers of the deleted Header records are stored in the Deleted record series as *negative numbers*. Negative values are used to differentiate Header record numbers from Master record numbers, so that records are always reused in the correct files.

## Master File Record Structure

Every Master file record contains the following components:

- Numeric pointers to the records that contain Ordered Element values immediately lesser and greater than those of the record in question.
- Three or more alphanumeric strings, with each string representing one element value.

The detail of each Master file record is as follows:

The first two values in each record are numbrs. The first number is a *forward pointer*, the record number of the record with the next greater Ordered Element in the Master file. The second number is a *backward pointer*, the record number of the record with the next smaller Ordered Element in the Master file. Whenever a Master file record contains the smallest Ordered Element value in the file, its *backward pointer* is 0 (there are no preceding records). If a Master file record contains the largest Ordered Element value in the file, its *forward pointer* is 0 (there are no following records).

Following these two numbers are alphanumeric strings representing element values. No matter what type of element is defined (Alphanumeric, Numeric-only or Dollars and cents), it is *always* stored as a *string*. At least three elements must be defined, of which the first is always the ID number. An example of a record might look as follows:

```

5 (Forward Pointer to record #5)
9 (Backward Pointer to record# 9)
255 (ID #255, stored as a string)
JOHN DOE (Name)
1220 SEVENTH AVENUE (Street)
ANYTOWN (City)
IOWA (State)
12345 (Zip code, stored as a string)

```

When in doubt as to whether a Master file value is stored as a string or as a number, follow this rule: Record numbers are stored as numbers, while everything else is stored as strings.

## Cautions

It is obvious that, once you understand IMPac's file structure, you can write programs to access and manipulate these files. There are several things to keep in mind when doing this, however. First, always backup all data files before accessing them with your own programs. If your programs destroy some of the data accidentally, the original data will be safe. Second, do not change the values of any Ordered Element in any record, because you risk throwing the data set out of sequence. Third, do not change the value of pointers in either the Master or Header files, because of the risk of losing the file sequence.

Element values in any Master file record can be changed by a user-written program, so long as the Ordered Element values stay the same. (This is the principle that the Modify function of UPDATE follows; attempts to change the Ordered Element value cause an error message.)



## Notes