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IDHS 1410 FORMATTED FILE SYSTEM

(IDHS 1410 FFS)

RETRIEVAL AND OUTPUT MANUAL

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SECTION ONE

INTRODUCTION TO RETRIEVAL

1-1. GENERAL:

a. Industry today depends upon the accurate analysis of large amounts of multisource information which must be brought together, collated, evaluated, categorized, and filed in such a manner that the rapid retrieval of specific items by a variety of systems is possible. All of this must be done quickly and thoroughly if the information is to be of maximum use for decision making. The difficulty and time required to assemb , collate, digest, and evaluate the information collected increases considerably when there is only a modest increase in the volume, types, and sources of information.

b. As the amount of information available increases and as the demands placed upon the analyst multiply (in terms of quality, quantity, and comprehensiveness), the time he can allot to researching a problem and assembling material for analysis becomes critical. Because of the great speeds made possible by electronic methods, a computer lends itself to handling the volumes of data which must be processed. The increased speed also makes possible a more detailed and comprehensive analysis than could have been undertaken by manual techniques. To translate and execute the analyst's requirements for data is the purpose of the retrieval system.

1-2. ANALYST/DATA RELATIONSHIP:

a. Prior to automatic data processing, the analyst generally maintained a close relationship with his particular data of interest. As new data was added or changed, the analyst was required, at the time of input, to study, analyze, and file or discard the information. Thus, the analyst was fortified with current knowledge of his subject, and depending on the adequacy of his filing system and the volume of data involved, could access pertinent data rapidly.

b. Many advantages presented themselves with the introduction of a punch card system to maintain data. These advantages - when applied to appropriate situations - saved the analyst time in preparing "hard copy" of finished data. The punch card system, however, tended to remove the analyst from his data. No longer was he able to have direct access to a particular item of information. Rather, it was necessary to require a listing of a range of information - and upon receipt of the listing, the analyst would select his required information from the listing.

c. The Formatted File System (FFS) has allowed the analyst to return to his earlier position of being on top of his data, as well as the addition of the other benefits inherent to computer processing mentioned earlier. Being on top of data is possible through the high speeds available with electronic processing techniques, and with respect to using data, a relatively simple technique of requesting unique data from the computing system.

1-3. THE 1410 FORMATTED FILE SYSTEM: The 1410 Formatted File System (1410 FFS) is a general purpose, flexible data handling system which increases the comprehensiveness and accuracy and greatly accelerates the development of reports from the data. The 1410 FFS consi ' ' of specially developed programs coupled with the 1410/7010 Operating System. Figure 1-1 illustrates the major components of the 1410 FFS. The retrieval and output sections will be the two areas covered in this manual.

a. The 1410/7010 Operating System.

(1) The fundamental purpose of the operating system is to enable the writing, assembling, and execution of programs with a minimum expenditure of programmer time, machine-operator time, and machine time. These are accomplished by means of:

Programming Systems (COBOL, FORTRAN, Autocoder)

Service Programs (Input/Output Control System, Tape Sort, System Generation, Teleprocessing Supervisor, Random Processing Scheduler, Utility Programs)

Systems Monitor (Resident Monitor, Linkage Leader, Transitional Monitor)

(2) One of the purposes of system monitor is to control the sequencing and monitoring of the programs which are an integral part of the operating system itself, as well as the Formatted File System programs which operate within the framework of the operating syste.. As the heart of the operating system, the system monitor performs other such major functions as the assignment of input/output units, transition between jobs, program loading and relocation, and the linkage of independently compiled programs. Communicati with the operator is also accomplished by system monitor for such things as errors or required setups for programs associated with the operating system. Operating procedures are standardized and simplified as much as practical.

b. The Formatted File System Programs. Each of the special purpose FFS programs is designed to operate within the framework of the 1410/7010 Operating System. Although each of the FFS programs is itself a consolidation of several programs, it is convenient to group them into the following six functional areas:

File Generation
File Maintenance
FFS Librarian
Permanent Disk File Updater
Retrieval
Ouput Processing

The function of each of the FFS programs is very briefly described below:

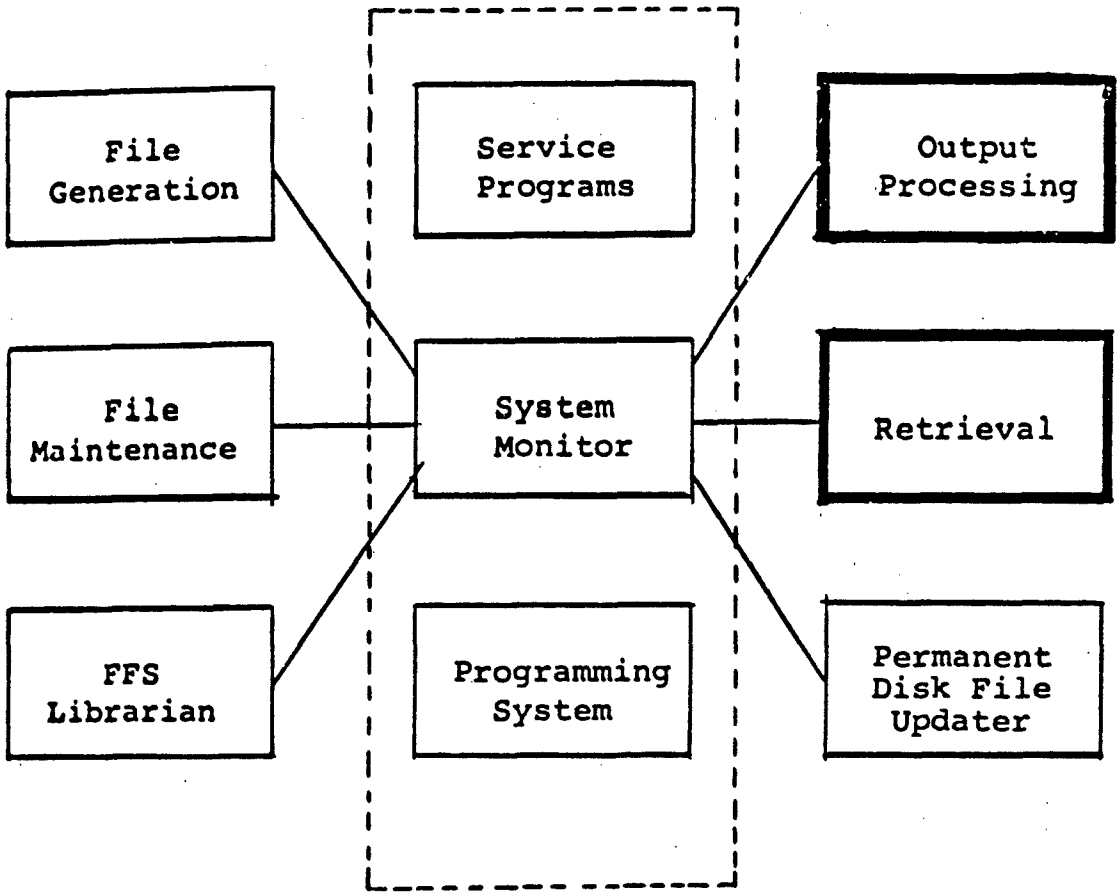


Figure 1-1. Major Components of the 1410 Formatted File System (FFS)

(1) File Generation. Structures new files, restructures existing files, and provides for file data rearrangement from the previous file structure to the new file structure.

(2) File Maintenance. Maintains the data content of the files by changing, adding to, or deleting existing data entries; or creating new data entries in the files. The input data supplied by the user may be extracted, converted, edited, etc., as specified by the user. File maintenance also provides a table of contents (cross index and file data table) for each file it maintains. A record of all maintenance performed is generated for confirmation purposes.

(3) FFS Librarian. Keeps the items which are stored in the FFS Relocatable Execution Library up to date. This includes file data tables and cross indexes.

(4) Permanent Disk File Updater. Keeps the items which are stored on permanent disk up to date. This includes file data tables and cross indexes.

(5) Retrieval. Selectively obtains information from the files, based upon parameters specified in reports or requests supplied by the user. The information retrieved may be sorted by selected data content, as well as by various other criteria. The retrieved data is stored on an answer tape and used as an input to the output processing program.

(6) Output Processing. Structures report formats based upon specifications supplied by the user. The information retrieved from the files by retrieval is extracted, edited, converted, and/or formatted as specified, and output in the form of reports. A variety of counts, totals, and computations may also be performed, and included in the report. Also provided are capabilities for outputting directly from the data file, and for outputting the transaction confirmation tape from file maintenance.

1-4. THE FLOW OF THE RETRIEVAL SYSTEM: The analyst/data relationship for extracting information from the FFS through retrieval is portrayed in figure 1-2. The flow is designed considering:

Rapid analyst advancement to a high degree of proficiency in requesting data.

Minimum lag time from information requirement to receipt of desired information.

Minimum analyst input effort.

Monitoring of input requirements and resulting output.

a. Formatting the Requirement. The analyst formats his retrieval requirement and selects the desired output format for the information. Difficulties encountered in this process are submitted to a systems programmer for

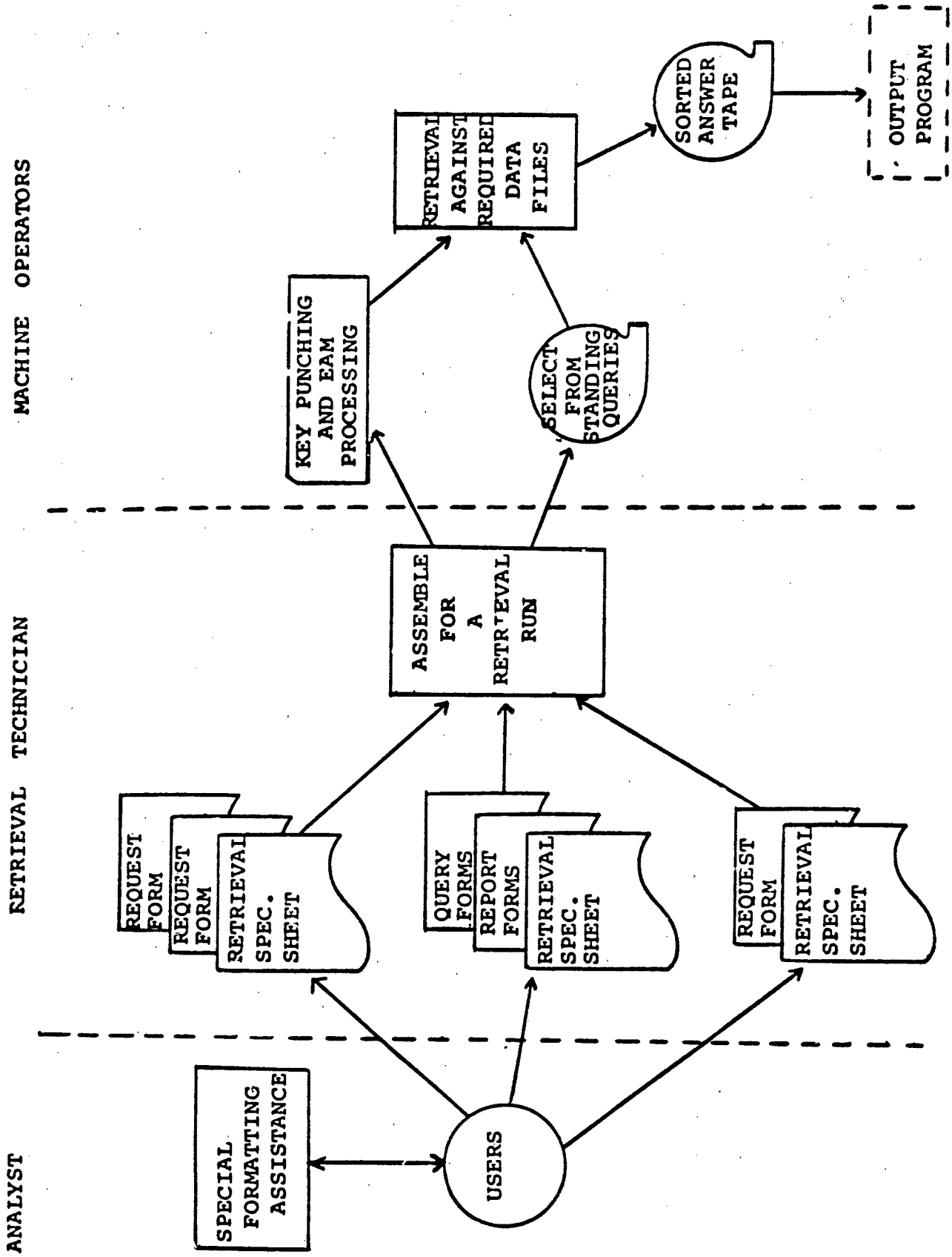


Figure 1-2. Retrieval Flow

analysis. Upon completing the analysis, the systems programmer will return the results of his analysis to the analyst. This will aid the analyst in gaining an independent status where he has little reliance on the systems programmer. Also, the analyst will maintain control over the requirement with the respect to urgency of the request, and special instructions he may have for the retrieval technician.

b. Submitting the Requirement. The analyst then submits his requirement to the retrieval technician who prepares all retrieval requirements for the computer. The retrieval technician is the analyst's contact with hi data, and will schedule and monitor the computer run to assure that the information is supplied on schedule. The retrieval technician will also assure that retrieval input forms which need punching or external processing prior to the computer run are processed and he will "proof" the requests prior to the computer run. This relieves the analyst from the burden of monitoring his input forms as they are processed.

c. The Computer. The retrieval requirements are then processed on the computer against the appropriate data files. The results from the computer run may be on magnetic tape, punched cards, or paper - depending on the analyst's requirements.

d. The Results. The results of the computer run are then reviewed by the retrieval technician. A check will be made to ascertain the gross validity of each retrieval requirement. The information will be returned to the analyst with any appropriate comments.

1-5. THE GUIDE - APPENDIX B: Appendix B has been provided to guide the analyst in using retrieval while becoming acquainted with the capabilities available. The appendix will direct the analyst's attention to factors he must consider in formatting his requirements, thus foregoing the necessity of having previous familiarity with all the factors which may affect his requirement. This guide, however, will not replace the understanding obtained by becoming familiar with the entire manual.

SECTION TWO

DATA ORGANIZATION

2-1. GENERAL: It is necessary for an analyst, in using retrieval, to have at least a basic understanding of the organization of data files and the records which make up the file. This section gives a general outline of the format of data records, with particular reference to the effects of data record arrangement on retrieval. Also, the terminology necessary to fully understand the remainder of the manual is defined.

2-2. THE FORMATTED FILE: Large amounts of multisource information covering a broad range of subjects are received at the data processing complex in varied forms. This information is categorized by subject and/or application and added to a collection of similarly categorized data called a file. To aid in placing each element of information into the file, and subsequently retrieving it, the files have a definite structure or pattern called the file format. The file format is designed so that when the information is arranged according to the prescribed format each grouping of the elements of information contains a complete description of an activity, event, person, objective thing, etc. Each such grouping is called a file record. Thus, a formatted file is an ordered collection of file records, each of which contains data arranged according to a previously established file format.

2-3. THE FILE RECORD:

a. Fields. The file record is a collection of elements of data arranged in the pattern specified by the file format. The smallest unit of data is the field. Each field has a defined length and contains only one specific type of data. If the data content of the field is fixed data, the field is a fixed field and will appear only once within the file record. If the data content of the field is periodic data, the field is a periodic field and may appear many times within the file record.

b. Groups. Within the file record there can exist a closer relationship between some of the fields than exists between other fields. These fields are considered as one element and called a group. Groups are collections of two or more fields within a file record which may be considered as a single data entity. These groups may be periodic groups or fixed groups but cannot be a combination of fixed and periodic fields. Fields within the groups do not lose their identity and may be treated as any other fields.

c. Sets. The data fields and/or groups are categorized according to the type of data content:

Fixed Set (Fixed Fields)

Periodic Sets (Periodic Fields)

Variable Set (undefined field)

It is important for the analyst, in employing retrieval, to be aware of t set in which his data of interest is stored. Information carried in the fixed and periodic sets may be accessed by retrieval. However, due to th unformatted nature of variable information, it is NOT POSSIBLE TO RETRIEV AGAINST DATA IN THE VARIABLE SET.

(1) Fixed Set. As implied by its name, fixed data occupies absolute or "fixed" locations in a data record. The fixed set is made up of fixed fields which contain nonrepeating information. When an item is be maintained as fixed information, a specific area in the data record is allocated for this information. The fixed set is always at the beginning of the record.

(2) Periodic Set.

(a) The periodic set(s), if any, of a data record contain information that is of a repetitious nature. Each periodic set consists one or more periodic subsets. The periodic subset is one or more fields which describe(s) some periodic (repeating) event or activity. These per odic subsets may be repeated many times in one periodic set with each sub having the same structure.

(b) Due to the nature of the periodic set, the analyst mu give careful consideration when formatting a retrieval against periodic d The following sections will define the rules necessary in retrieving agai the periodic data.

(3) Variable Set. The 1410 FFS allows for one additional type data to be entered into the file record. It is data which cannot be read formatted and is typified by remarks or comments which are often added locally and not received from the ordinary sources. This unformatted dat is entered into a set called the variable set. The variable set, unlike other sets, can contain only one field of variable length. This is the only field in the file record which is not of fixed length. There may be only one variable set (field) per file record. The variable set appears after the periodic set(s) in the file record. The data content of the variable set cannot be utilized as a parameter for retrieval or output, as may the data content of the fixed and periodic sets. However, the data content of a variable set may be retrieved, as may the data content of the fixed and periodic sets.

2-4. FILE RECORD FORMAT:

a. Figure 2-1 is a reference diagram illustrating the makeup of a file record. The nondata fields are outlined with dashed lines.

b. One point illustrated by figure 2-1 which has not been discussed is the inclusion of a field in more than one group. Notice periodic field 2E in each of the periodic subsets of periodic set 2. It is included in periodic group 2F as well as 2H. Thus field 2E may be referenced by referring to:

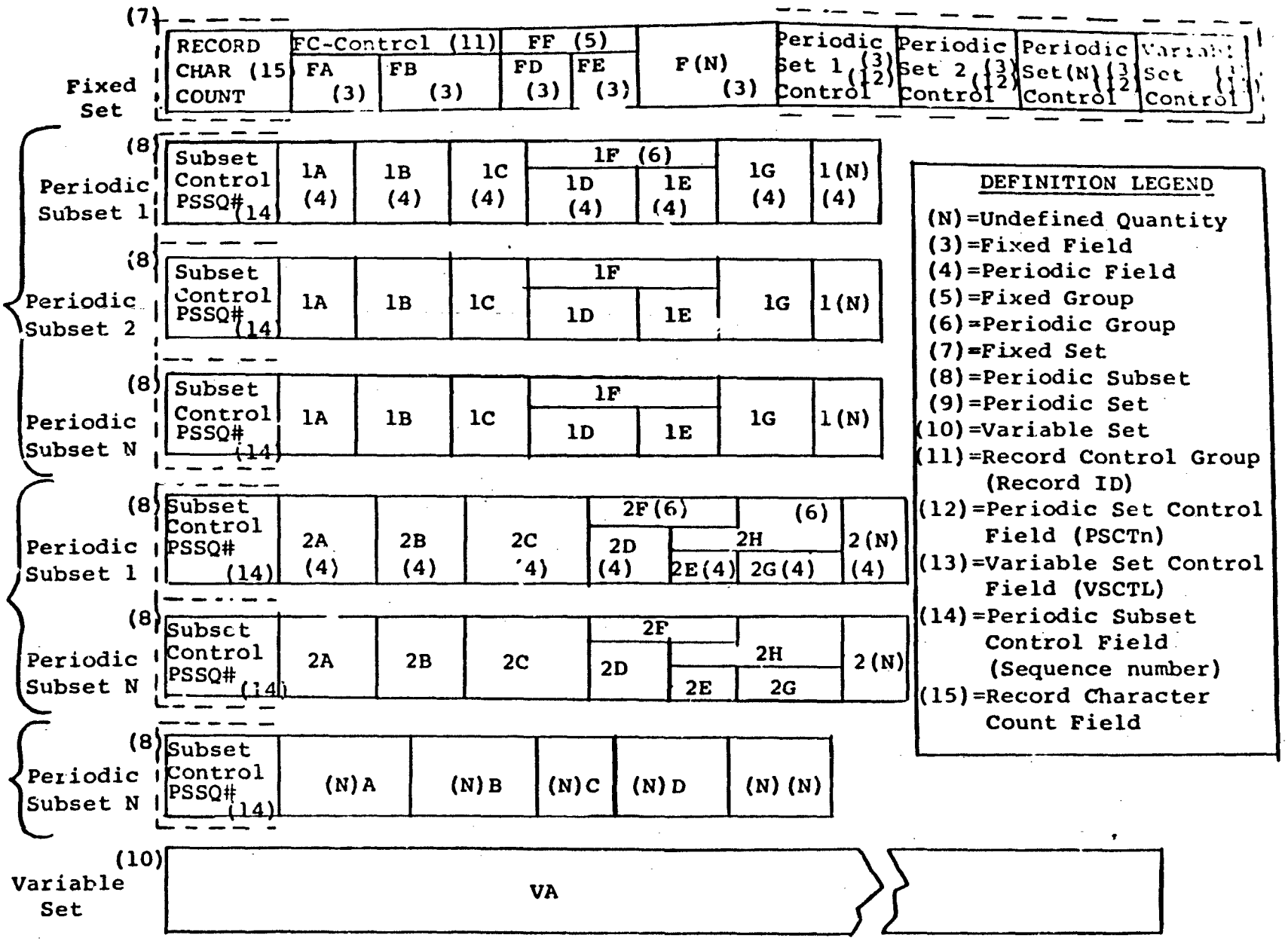


Figure 2-1. 1410 FFS File Record Layout

Field 2E

Group 2F (field 2E accompanied by 2D)

Group 2H (field 2E accompanied by 2G)

c. Some means must be provided for distinguishing one file record from another, so that each may have a unique identity. In the 1410 FFS this is accomplished by each file record having unique data content in a special group called the record control group or record ID. This record control group consists of several of the initial fixed fields in the fixed set. The file designer insures that the characteristics of the combined data content in the record control group is such that no two file records will ever have identical data in their record control groups. In figure 2-1 fixed fields FA and FB are the components of the fixed group FC, which is the record control group or record ID.

2-5. TERMINOLOGY: The following terminology is required to fully understand the structure and use of the files.

FIELD	-	A field defines a basic unit of information in the data record.
GROUP	-	A group is a combination of adjacent fields of same type.
FIXED FIELD	-	The basic unit of information in the fixed set of the data record.
FIXED SET	-	The collection of all fixed fields and groups (also fixed section).
PERIODIC FIELD	-	The basic unit of information in the periodic set.
PERIODIC GROUP	-	A combination of periodic fields.
PERIODIC SUBSET	-	As stated earlier, periodic information is of a recurring nature. Each segment of the recurring information is termed a periodic subset, and is comprised of periodic fields and groups.
PERIODIC SET	-	The collection of periodic subsets having the same format and information type. A data record may have up to eight periodic sets in the periodic section.
RECORD ID	-	A field or group of fields which uniquely identify each data record.
VARIABLE SET	-	The section of a data record that has a free format, and generally carries remarks.

2-6. SAMPLE FILES: Two sample file descriptions will be included in this section. These files will be used throughout the manual to illustrate the use of the retrieval system. The file description is divided into three formats.

a. File Specification Sheet - Retrieval. The File Specification Sheet provides general information about the file. Figure 2-2 (CMFLA) is an illustration of a file specification sheet. It contains:

File Mnemonic.

File Numeric.

File Order - gives the order of the records.

Data Implementation - indicates the frequency and source of updating the file.

Purpose.

File Structure.

Data Record - describes the type of control for each set.

Cross Indexes - lists the cross index for the file.

b. Graphic Description. The graphic description demonstrates the physical organization of the data file. The associated logic mode assigned to each periodic set is carried in each periodic set heading. See figure 2-3 (CMFLA File).

c. Detailed Description. The detailed description provides the necessary information to retrieve against the data file. This is illustrated in figures 2-4, 2-5, 2-6, 2-7, 2-8 (CMFLA File) and includes:

(1) Title - The title column provides the link between the graphic and detailed description sections. The title will generally reflect the contents of a data field.

(2) Synonyms/Mnemonic - This column contains all names by which a data field may be referenced. The last entry in each group is the mnemonic. When employing a mnemonic to reference a data field, the entire mnemonic must be present - including trailing blanks (represented by "ß").

(3) Description - The description elaborates on the contents of each data field.

(4) Entry Instructions - The format of the data in each data field is described in this column. In constructing a logic term against a data field, the legitimate data values and formats allowed to test the field will be outlined in this section.

(5) Type/Size - The type/size entry completes the necessa information to retrieve against a data field. The column states whe the data field is alpha or numeric and gives the size of the field. expansion of the implications of alpha and numeric fields in stating retrieval requirements will be found under "General Rules for Logic (in section five.)

The AIRØA File (Airport File) will be described in figures 2-9 throug 2-14.

2-7. REVIEW - DATA ORGANIZATION: Data records are divided into thre sections: Fixed, periodic, and variable.

a. Only fixed and periodic sets may be employed for retrieval.

b. The fixed and periodic sections are broken into fields and groups, which define unique information.

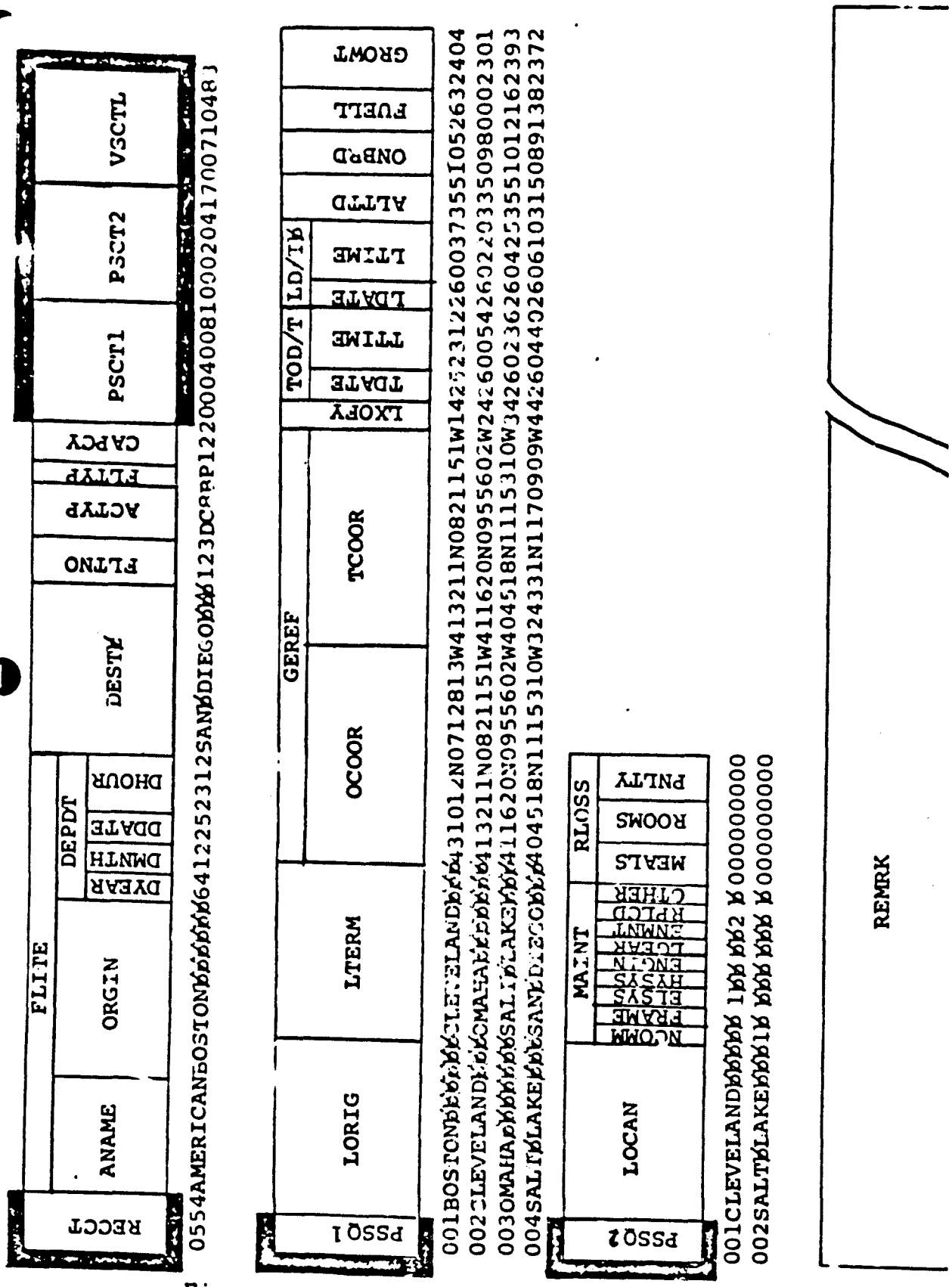
c. There is no interrelationship between fixed information and any other information; however, an interrelationship generally exists periodic information.

FILE SPECIFICATION SHEET - RETRIEVAL

COMMERCIAL FLIGHTS FILE

FILE MNEMONIC	CMFLA
FILE NUMERIC	17
FILE ORDER	Ascending Sequence (1) Airline Name (2) Flight origin (3) Scheduled Departure Date
DATA SOURCE	Updated by inputs from the Commercial Airlines at 24-hour intervals.
PURPOSE	Provides a history of all commercial airline flights within the United States.
FILE STRUCTURE	A data record exists for each flight from origin to final destination.
DATA RECORD	The Fixed Set of the data record gives the names of the origin and final destination points, the airline name, date and time of scheduled departure, flight number, aircraft type, and type of flight. Periodic Set One gives information on each leg of the flight including names and coordinates of cities or terminals of leg origin and leg destination, leg number, actual take-off date and time, landing date and time, average altitude, number of passengers, fuel loaded at origin, and take-off gross weight. (SCAN MODE) Periodic Set Two gives detailed information on any unscheduled maintenance including point at which the maintenance is performed, type of maintenance, replacement of aircraft, meals furnished, passengers billeted and amount of freight penalty. (SCAN MODE)
CROSS INDEX	DEST (FINAL DESTINATION) CMFLX

Figure 2-2, File Specification Sheet - Retrieval


RECCT
FLIHE
ANAME
ORGIN
DEPDT
DYEAR
DMNTH
DDATE
DHOUR
DESTN
FLTNO
ACTYP
FLTYP
CAPCY
PSCT1
PSCT2
VSCTL
0554AMERICANBOSTONBBBBBBBBBB64122523125ANBDIEGOBBBB123DCBBP12200040081000204170071048
LORIG
LTERM
GEREF
OCOOR
TCOOR
LXOFY
TOD/T
TDATE
TTIME
LD/TB
LDATE
LTIME
ALTTD
ONBRD
FUELL
GROWT
PSSQ1
001BOSTONBBBBBBBBBBCLEVELANDBBBB43101400712813W41321100821151W14223122600373551052632404
002CLEVELANDBBBBCMAHABBBBBBBB413211N08211151W41162ON09556024260054260220335098000230 1
003OMAHABBBBBBBBBBSALTBLAKEBBBB41162ON09556024045 18N11153 10W34260236260425355101216239 3
004SALTBLAKEBBBBSANBDIEGOBBBB40451 8N11153 10W32433 1N11709 09W44260440260610315089138237 2
LOCAN
NCOMM
FRAME
ELSYS
HYSYS
ENGIN
LGEAR
ENMNT
RPLCD
OTHER
MAINT
MEALS
ROOMS
PNLTY
RLOSS
PSSQ2
001CLEVELANDBBBBBBBBBB

DETAILED DESCRIPTION - COMMERCIAL FLIGHT FILE (CMFLA)

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
FLIGHT	FLITE	Airline Name, Flight, Origin and Scheduled Departure Date Complete Record ID	See Following Fields	A	30
AIRLINE NAME	AIRLINE-NAME AIRLINE ANAME	All commercial airlines having scheduled flights	Complete airline name or standard abbreviation	A	8
FLIGHT ORIGIN	DEPARTURE-POINT FLIGHT-ORIGIN ORGIN	Name of departure terminal or city	Standard City or terminal Name	A	12
SCHEDULED DEPARTURE	DEPARTURE-DATE DEPDT	Fixed Group	See Following Fields	N	10
YEAR	DYEAR	Year of Departure	Insert last two digits of year	N	2
MONTH	DMNTH	Month of Departure	Insert digits to represent month	N	2
DAY	DEP-DAY DDATE	Day of Departure	Insert digits to represent day	N	2
HOUR/MINUTE	DHOUR	Hour and Minute of Departure	Use 2400 hour/minute record	N	4
FINAL DESTINATION	ARRIVAL-POINT DESTINATION-CITY DESTØ	Name of Destination City or Terminal	Standard City or Terminal Name	A	12

Figure 2-4, Detailed Description - CMFLA File

DETAILED DESCRIPTION - COMMERCIAL FLIGHT FILE (CMFLA)

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
FLIGHT NUMBER	FLTNO	Scheduled Aircraft Flight Number	Three Numeric Characters	N	3
AIRCRAFT TYPE	AIRCRAFT-TYPE A/C-TYPE ACTYP	Aircraft Type for Flight	Standard Aircraft Name or Abbreviation	A	4
FLIGHT TYPE	FLIGHT-TYPE FLTYP	Passenger Flight Cargo Dead-Head Charter Other, See REMRK	P C D T X	A	1
CAPACITY	CAPACITY CAPCY	Maximum Seating or Cargo Tonnage Capacity of Aircraft	Three Numeric Characters Range 006 to 180	N	3
PERIODIC SET CONTROL FIELDS	PSCT1	Periodic Set Control Fields (One for Each of the Two Periodic Sets)	A Blank Control Field Indicates No Data For the Set	N	8
	PSCT2			N	8
VARIABLE SET CONTROL FIELD	VSCTL	Variable Set Control Field		N	8
PERIODIC SUBSET SEQUENCE NUMBER	PSSQ1	Indicates Periodic Subset Sequence Number	Three Numeric Characters	N	3
LEG ORIGIN	LEG-ORIGIN LORIG	City or Terminal Associated with Take-Off	Standard City or Terminal Name	A	12
LEG TERMINATION	LEG-TERMINATION LTERM	City or Terminal Associated with landing	Standard City or Terminal Name	A	12
GEOGRAPHIC REFERENCE	GEREF	Periodic Group	See Fields Below	A	30

Figure 2-5, Detailed Description - Commercial Flight File

DETAILED DESCRIPTION - COMMERCIAL FLIGHT FILE (CMFLA)

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
LEG ORIGIN COORD	LEG-ORIGIN-COORD OCOOR	Standard Coord. Format*	Airport Coordinates	A	15
LEG TERM COORD	LEG-TERM-COORD TCOOR	Standard Coord. Format*	Airport Coordinates	A	15
LEG X of Y	LEG-X-of-Y LXOFY	1st digit is seq.No. of Leg in Itinerary; 2nd digit is Total No. of Legs	Two Digits	N	2
TAKEOFF DATE/ TIME	TAKEOFF-DATE-TIME TO-DT/TIME TOD/T	Periodic Group	See Fields Below	N	6
TAKEOFF DATE	TDATE TOD/T	Day of Month	00-31	N	2
TAKEOFF TIME	TTIME	Hour and Minute	0000 - 2400	N	4
LANDING DATE/ TIME	LANDING-DATE-TIME LD/TØ	Periodic Group	See Fields Below	N	6
LANDING DATE	LDATE	Day of Month	00-31	N	2
LANDING TIME	LTIME	Hour and Minute	0000 - 2400	N	4
AVERAGE ALTITUDE	AVG-ALT ALTTD	Altitude in Hundreds of Feet	000 - 999	N	3

*NOTE: The polygon operator may not be used on the fields.

Figure 2-6, Detailed Description - Commercial Flight File

DETAILED DESCRIPTION - COMMERCIAL FLIGHT FILE (CMFLA)

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
ON BOARD	ON-BOARD ONBRD	Filled Capacity for This Leg	Seating Capacity or Tonnage Capacity Filled	N	3
FUEL LOADED AT LEG ORIGIN	FUEL-LOADED FUELL	Hundreds of Pounds	000 - 999	N	3
TAKEOFF GROSS WEIGHT	TAKEOFF-WEIGHT GROWT	Hundreds of Pounds	0000 - 9999	N	4
PERIODIC SUB-SET SEQUENCE NUMBER	PSSQ2	Subset Sequence within Set		N	3
LOCATION	LOCATION LOCAN	Airport Name		A	12
UNSCHED-MAINT.	MAINT	Periodic Group	See Fields Below	N	9
NAV/COMM	NAV/COMM NCOMM	Maintenance in	All Fields of Group	N	1
AIRFRAME	AIRFRAME FRAME	0	No Maintenance	N	1
ELECTRICAL SYSTEM	ELEC-SYS ELSYS	1	Maintenance Performed This Trip	N	1
HYDRAULIC SYSTEM	HYDR-SYS HYSYS	2	Special Case - Explained in Vset (REMRK)	N	1
ENGINE	ENGINE ENGIN			N	1
LANDING GEAR	LDG-GEAR LGEAR			N	1
ENVIRONMENT CONTROL	ENV-CONTROL ENMNT			N	1

DETAILED DESCRIPTION - COMMERCIAL FLIGHT FILE (CMFLA)

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
AIRCRAFT REPLACED	A/C-REPLACED RPLCD	Ø 1 2 (See REMRK)	Aircraft Not Replaced Aircraft Replaced - Same Type Aircraft Replaced - Other Type	N	1
OTHER	OTHER	No Entry See REMRK	Ø 1	N	1
REVENUE LOSS	REVENUE-LOSS RLOSS	Periodic Group	See Fields Below	N	9
PASS.MEALS PUR.	MEALS	Number of Meals Purchased	000 - 999	N	3
PASS. BILLETED	ROOMS	Number of Billets Provided	000 - 999	N	3
FREIGHT PENALTY	PENALTY PNLTY	Dollars Freight Penalty	000 - 999	N	3
REMARKS	REMRK	Remarks	Remarks About Special Problems	A	Var

Figure 2-8, Detailed Description - Commercial Flight File

FILE SPECIFICATION SHEET - RETRIEVAL

AIRPORT FILE

FILE MNEMONIC	AIRØA
FILE NUMERIC	11
FILE ORDER	Ascending Sequence (1) State (2) Airfield Name
DATA IMPLEMENTATION	Civil Aeronautics Board, at one-month intervals.
PURPOSE	Provides a catalogue of all air terminals servicing commercial airlines.
FILE STRUCTURE	A data record exists for each air terminal.
DATA RECORD	The Fixed Set contains static airport information, including airfield name and coordinates, runway specifications aircraft and passenger limitations.
	Periodic Set One contains percentage of daily operating capacity for passenger and aircraft. The percentages are maintained for each day of the week.
	Periodic Set Two contains the names of all airlines servicing the airport.
	Periodic Set Three contains the control zones maintained by the airport.
	Periodic Set Four contains qualitative remarks.
CROSS INDEXES	NONE

Figure 2-9, File Specification - AIRØA File

GRAPHIC DISPLAY - AIRPORT FILE

FIXED SET

STATE	AIRPORT NAME	CITY	RUNWAY COORDINATES	RUNWAY-LENGTH/SURFACE		NUMBER OF RUNWAYS	PARALLEL RUNWAYS	MAXIMUM AIRCRAFT CAPACITY PER DAY	MAXIMUM AIRCRAFT CAPACITY PER HOUR
				RUNWAY LENGTH	RUNWAY SURFACE				

MAXIMUM PASSENGER CAPACITY PER DAY	MAXIMUM PASSENGER CAPACITY PER HOUR	PERIODIC SET ONE CONTROL	PERIODIC SET TWO CONTROL	PERIODIC SET THREE CONTROL	PERIODIC SET FOUR CONTROL

PERIODIC SETS

PERIODIC SET ONE - INTRA MODE (SCAN)

PERIODIC SUBSET SEQUENCE NUMBER	DAY	PERCENT AIRCRAFT CAPACITY PER DAY	PERCENT PASSENGER CAPACITY PER DAY	PERIODIC SUBSET SEQUENCE NUMBER	DAY

PERIODIC SET TWO - INTER MODE

PERIODIC SUBSET SEQUENCE NUMBER	AIRLINE NAME	PERIODIC SUBSET SEQUENCE NUMBER	AIRLINE NAME	PERIODIC SUBSET SEQUENCE NUMBER

PERIODIC SET THREE - INTRA MODE (TERMINATE)

PERIODIC SUBSET SEQUENCE NUMBER	AIR CONTROL ZONE (SIX COORDINATES MAXIMUM)	PERIODIC SUBSET SEQUENCE NUMBER	AIR CONTROL ZONE (SIX COORDINATES MAXIMUM)	PERIODIC SUBSET SEQUENCE NUMBER

PERIODIC SET FOUR - INTRA MODE (SCAN)

PERIODIC SUBSET SEQUENCE NUMBER	GENERAL REMARKS TYPE	SPECIFIC REMARKS TYPE	REMARKS	PERIODIC SUBSET SEQUENCE NUMBER

Figure 2-10

DETAILED DESCRIPTION - AIRPORT FILE

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
STATE	STATE	The airport's state of location.	The complete state name or five-character truncation. Only the first five characters are carried in the field.	A	5
AIRPORT NAME	AIRPORT APORT	Name of airport.	Standard airport name.	A	12
CITY	CITY CITYØ	City airport services.	Standard city name.	A	12
RUNWAY COORDINATES	RUNWAY-COORD LOCATION COORD	Center coordinates of runway.	Standard 13-character coordinate format.	A	13
RUNWAY LENGTH	RUNWAY-LENGTH LENGTH RNWYL	Length of longest runway.	Length of runway in hundreds of feet, e.g., 60 equals 6000.	N	3
RUNWAY SURFACE	RUNWAY-SURFACE SURFACE RNWYS	Surface material of major runway.	Single character code of 1 - grass 2 - asphalt 3 - concrete	N	1
RUNWAY - LENGTH/SURFACE	RNWYSL RNYSL	Group of Runway Length and Surface.	Enter combination of runway length first, runway surface second, e.g., 0601.	N	4

Figure 2-11, DETAILED DESCRIPTION - AIRPORT FILE

DETAILED DESCRIPTION - AIRPORT FILE

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTION	EC	SIZE
NUMBER OF RUNWAYS	NUMBER NUMØØ	Number of major runways.	Two numeric characters. Range: 01 to 10	N	2
PARALLEL RUNWAYS	PARALLEL RNWYP	Field indicates if airport can handle simultaneous landings and takeoffs.	Single character code of: Y - parallel runways N - no parallel runways	A	1
MAXIMUM AIRCRAFT CAPACITY PER DAY	A/C-CAP ACCAP	Theoretical aircraft daily handling capacity.	Four-character numeric. Range: 0005 to 1400.	N	4
MAXIMUM AIRCRAFT CAPACITY PER HOUR	A/C-HOUR ACHRØ	Theoretical aircraft hourly handling capacity.	Two-character numeric. Range: 02 to 70	N	2
MAXIMUM PASSENGER CAPACITY PER DAY	PASS-DAY PDAY PDAYØ	Theoretical daily passenger handling capacity	Number of passengers in hundreds, e.g., 14 equals 1400.	N	2
MAXIMUM PASSENGER CAPACITY PER HOUR	PASS-HOUR PHOUR	Theoretical hourly passenger handling capacity.	Number of passengers in hundreds, e.g., 2 equals 200.	N	2
DAY	DAY DAYØØ	Day of week (Monday-Sunday)	Complete day name or three-character truncation.	A	3

Figure 2-12, Detailed Description - Airport File

DETAILED DESCRIPTION - AIRPORT FILE

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
PERCENT AIRCRAFT CAPACITY PER DAY	%-A/C-CAP PACCP	Percentage of current maximum theoretical aircraft handling capacity for specified day.	Three-character percentage (0 to 100).	N	3
PERCENT PASSENGER CAPACITY PER DAY	%-A/C-CAP PPSCP	Percentage of current maximum theoretical passenger handling capacity for specified day.	Three character percentage (0 to 100).	N	3
AIRLINE NAME	AIRLINE ALINE	All commercial airlines servicing terminal.	Complete airline name or standard abbreviation	A	12
AIR CONTROL ZONE	CONTROL-ZONE ZONE ZONEØ	Polygon describing airport air control zone.	Can only be accessed with POLYGON OPERATOR.	A	78
GENERAL REMARKS TYPE	RMKS-GEN RMKSG	Indicates general remark type carried in Periodic Subset.	Single character code of 1 - Overhaul/repair 2 - Fueling facilities 3 - Traffic control	N	1
SPECIFIC REMARKS TYPE	RMKS-SPC RMKSS	Where applicable, indicates if remark pertains to jet or prop aircraft.	Single character code of blank- not applicable 1 - jet 2 - prop	A	1

Figure 2-13, Detailed Description - Airport File

DETAILED DESCRIPTION - AIRPORT FILE

TITLE	SYNONYMS MNEMONIC	DESCRIPTION	ENTRY INSTRUCTIONS	TYPE	SIZE
REMARKS	REMARKS RMKS RMKSØ	Qualitative remarks.	Not accessible other than by direct match on remark.	A	60
PERIODIC SUBSET SEQUENCE NUMBER	PSSQn (n equals Periodic Subset number)	Indicates Periodic Subset Sequence number.	Three numeric characters.	N	3
PERIODIC SET CONTROL FIELD	PSCTn (n equals Periodic Set number)	Periodic Set Control field.	Blank Periodic Set control field indicates no entries for Periodic Set n.	N	8

Figure 2-14, Detailed Description - Airport File

SECTION THREE

THE STRUCTURE OF THE LANGUAGE

3-1. THE LANGUAGE OF RETRIEVAL: The analyst communicates his requirements to retrieval through a retrieval language. It employs English words and a free format. After a short exposure to the language an analyst will have no difficulty in understanding or employing the language. The following is an example of the retrieval question and the language used to express it:

Question: Retrieve records of United Air Lines flights that were made by DC8's or 707's, from New York City to San Francisco, if the departure date were January 1965.

Stated in retrieval language, this would be:

```
IF,AIRLINE-NAME,EQUALS,UNITED,
AND,AIRCRAFT-TYPE,EQUALS,DC8,
OR,AIRCRAFT-TYPE,EQUALS,707,
AND,FLIGHT-ORIGIN,EQUALS,NEW YORK CITY,
AND,FINAL-DESTINATION,EQUALS,SAN FRANCISCO,
AND,YEAR,EQUALS,65,
AND,MONTH,EQUALS,Ø1,
```

The retrieval language is meaningful to the computer, but with some effort it can also be interpreted by the casual reader. The principal difference is the precise form and the language of logic. Retrieval will detect most format errors, and obvious logic errors; however, it must be realized that retrieval does not have the ability to tell an analyst if he is thinking clearly. For instance, if the first two terms of the previous example should have been

```
IF,AIRLINE-NAME,EQUALS,UNITED,
OR,AIRCRAFT-TYPE,EQUALS,DC8,
```

retrieval will be ignorant of this fact and retrieve using the "incorrect logic". Therefore, the analyst must learn the rules which govern the logic and follow them exactly. Prior to using retrieval effectively, the analyst must understand:

The structure of the files to be used.

The capabilities and limitations of the retrieval system.

The retrieval language.

The rules of logic.

3-2. LOGIC EXPRESSION: The retrieval language is written into a format called logic expression. A logic expression is a complete question directed against the data file. It is used to specify the conditions by

which a data record is to be retrieved. The logic expression contains one or more logic terms or statements. If it contains more than one term, the logic expression is sometimes referred to as a compound logic expression.

3-3. TERM: A term is a basic question, stated in retrieval language, and directed against a data file.

IF,AIRLINE-NAME,EQUALS,UNITED,

If this is the only term in the logic expression, then the retrieval system searches the file to find the records where the AIRLINE-NAME field is equal to "UNITED". If the condition is satisfied, the whole data record is retrieved and placed on a retrieval answer tape. As more terms are included in a logic expression, the expression becomes more selective and fewer records meet the conditions. A term must be completed on one card (70 cols) except for a geographical search which may use a maximum of three cards. The term or statement of logic is divided into four segments. Using the previous term as an example, the four segments are easily shown:

IF,	AIRLINE-NAME,	EQUALS,	UNITED,
A	B	C	D

A. Logical Connector.

B. Element Name (Field/Group).

C. Relational Operator.

D. Data Value.

The segments of the term must be separated by a comma. No blanks (b) are allowed between the segments. A comma must follow the last segment (data value). A single blank is allowed between words of the relational operator segment. These segments of the term are discussed in the following paragraphs. In section six, a review of logic cards is given, along with examples.

a. Logic Connectors. Three words "IF" - "AND" - "OR" are used to tie together logical conditions. They always initiate the logic statement and establish the relationship between the logical conditions. IF and AND have the same effect on a logic condition. Normally, the IF is used as the connector of the initial term. Both of these connectors indicate an "anding" or plus effect between logic conditions.

IF,AIRLINE-NAME,EQUALS,UNITED,
AND,AIRCRAFT-TYPE,EQUALS,DC8,

The AND connector implies that both conditions must be satisfied befor the record is retrieved. The OR connector indicates an "either or bot effect between logic conditions.

IF,AIRLINE-NAME,EQUALS,UNITED,
OR,AIRCRAFT-TYPE,EQUALS,DC8,

In this example either term being satisfied will allow the retrieval o the record. Section four will explain in detail the rules of logic of compound logic expressions.

b. Element Name (Field/Group). Fields and groups have been giv unique names which, when referenced, will refer to the area in the dat record that is associated with the name. These names are called field or group mnemonics. The data content of the element specified in the term is tested against the data value supplied by the analyst. The referenced element must be in either the fixed or periodic sets. Retrie cannot be made against data in the variable set.

c. Synonyms.

(1) In order to conserve space inside the computer, field a group mnemonics have been limited to five characters. To avoid the necessity of having an analyst learn these ofttimes highly formatted a cryptic mnemonics, retrieval has allowed for the use of synonyms.

(2) These synonyms are words with which the analyst is familiar and/or are words which are easily remembered. A field or gro may have more than one associated synonym, allowing a flexibility in vocabulary when a value may have several "common" names.

(3) The analyst is free to use any of the synonyms or the mnemonic when referring to a field or group. It must be remembered th when using a mnemonic or synonym, the data represented by the name is referenced, not the name.

d. The Data Value: In using retrieval, the analyst will be test the contents of a location in the data record referred to by a field o group name. The value supplied, with which the data element is tested, is called the data value. In the example,

IF,AIRLINE-NAME,EQUALS,UNITED,

the word "UNITED" is the data value supplied. Consequently, the AIRLI NAME field of all the data records will be tested for the contents "UNI and the record will be retrieved if the condition is satisfied. If the analyst is interested in American Airline flights, he would use a data value of AMERICAN.

Some points to remember concerning the data value are:

Numeric data values are padded on the left with zeroes if the value is shorter than the field.

Alphabetic data values are padded to the right with blanks (b) if short.

Numeric data values are truncated on the right if long.

Alphabetic data values are truncated on the right if long.

Data values cannot be part of the data record; i.e., the contents of one field of a data record cannot be tested against the contents of another field of the data record. Data values must be supplied by the analyst.

A maximum of nine data values may be included in one term except when using geographic operators:

OR,AIRLINE-NAME,EQUALS,UNITED,BRANIFF,TWA,

If the data value supplied is to be blanks, the word BLANK must appear as the data value on the card. Retrieval will supply the necessary number of blanks.

A dollar sign ($) may be placed in the data value, and specifies that any character will satisfy at the position of the dollar sign in the data value. A $ may not be placed in a cross-indexed data value.

e. Relational Operators.

(1) Simple Relational Operators. The relational operators enable the analyst to express the tests he desires to have performed. For example, the statement:

IF,AIRLINE-NAME,EQUALS,UNITED,

is built around the relationship established by the word "EQUALS", which is the relational operator. Another statement might be:

IF,CAPACITY,IS GREATER THAN,120,

The words "IS GREATER THAN" form the relational operator.

NOTE: Underlined words in operator phrases are required words. The remaining words are optional and are used in the operator phrase to improve readability.

The basic relational operators in retrieval are:

IS GREATER THAN

IS EQUAL TO

IS LESS THAN

(2) Compound Relational Operators. By employing these thre relational operators, any logical condition may be expressed. Howeve consider again the earlier condition:

IF,CAPACITY,IS GREATER THAN,120,

If an analyst desired to test the capacity to determine if it were eq to or greater than 120, using the three basic relational operators, t condition can be expressed using two statements:

IF,CAPACITY,IS EQUAL TO,120,
OR,CAPACITY,IS GREATER THAN,120,

To simplify the procedure, the analyst is allowed to group relational operators. Thus the preceding example may be stated:

IF,CAPACITY,IS EQUAL TO OR GREATER THAN,120,

A list of compound relational operators follows:

IS GREATER THAN OR EQUAL TO

IS LESS THAN OR EQUAL TO

IS LESS THAN OR GREATER THAN

It is important to note that the two conditions are linked by an "OR' condition. That is, either condition may satisfy the expression.

(3) Negative Relational Operators. NOT may be used with ar relational operator. Example:

NOT EQUAL

This could also be stated with a compound operator.

IS LESS THAN OR GREATER THAN

(4) Stating the Relational Operator. Complete freedom has supplied to the analyst in stating relational operators:

To state a simple or compound relational operator, only key words need be employed. The key words are those ur lined in the previous examples.

For any of the operator words, as few as two or more leadir characters of the word need be employed.

A set of special two-character abbreviations may also be used. For example:

GT - IS GREATER THAN

NE - NOT EQUAL

LT - IS LESS THAN

(5) Relational Operator Vocabulary. Following is a complete list of words which have an assigned meaning in retrieval, including both optional and key words. These words can be grouped to develop relational operators accepted by retrieval. Below each simple relational operator the key words are listed which will indicate the employment of that operator. Key words from simple relational operators may be combined to form complex relational operators following the rules established under paragraph entitled "Compound Relational Operators" (subparagraph 3-3.e(2)). The optional words are supplied only to improve readability and may be used or omitted at the analyst's discretion. However, when a word is included in a relational operator statement, the entire word must be spelled correctly.

IS EQUAL TO	IS GREATER THAN
Equals	GT
Equaling	After
Equal	Later
Equ	Greater
	Gre

IS LESS THAN	POLYGON OPERATOR
LT	OVP
Less	Polygon
Les	Overlaps
Before	Intersects (Geographic)
Earlier	

NEGATIVE RELATIONAL OPERATORS

NE (Special case of not equal)
NOT (Negation)

OPTIONAL WORDS

A	Of	Does
To	The	Within
Or	Than	Circle
Is	Search	Operator

f. Geographic Operator. In addition to the relational operator mentioned previously, there is a geographic operator which will perfor polygon searches.*

(1) Polygon Search Operator. The polygon search operator i used to determine if a value in the data record representing an area o the earth overlaps a specified polygon representing a user's area of interest. This operator permits the analyst to describe a convex poly around his area of interest, having a maximum of eight sides.

NOTE: The polygon operator will function only with a convex figure or a circle. A convex figure is defined as one not having an interior an greater than 180°. The subroutine Π 002S, which determines convenity, must be in the FFS Relocatable Execution Library whenever the polygon operator is The user's area of interest is specified to retrieval by its geographi coordinates. Each geographic coordinate is expressed in the following 15-character format:

300000N0300000W

The following is an example of a polygon statement where the data valu describes a triangle:

IF,CONTROL-ZONE,OVP,300000N0300000W,
310000N0300000W,300000N0310000W,

(2) Stating the Polygon Operator. In stating a polygon ope no reference to the type of search need be made.

NOTE: Any type of search may be stated in a negative way by use of th word "NOT." Example:

AND,COORD,NOT OVP,352030N0984030W,

A negative search must not be attempted against a cross-indexed field.

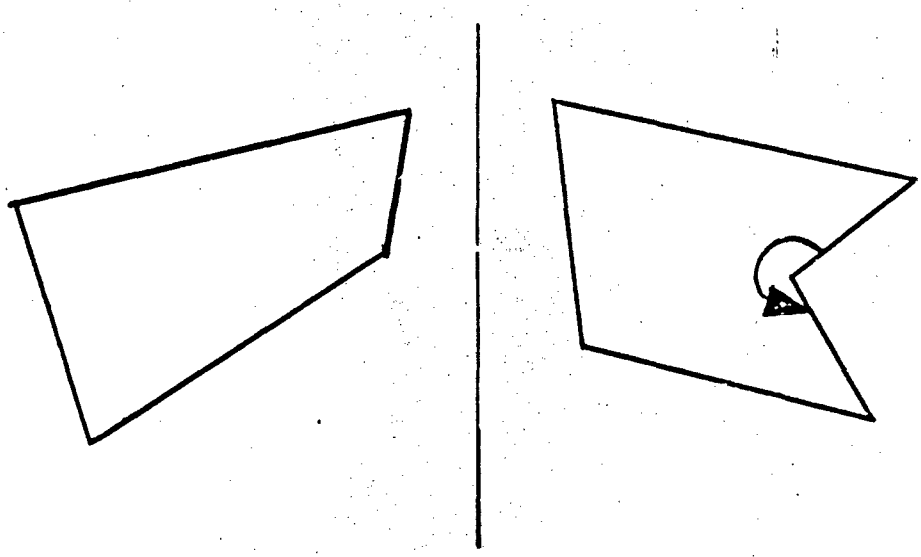
The following figures will illustrate:

concave and convex figures

the different types of searches using the polygon operator

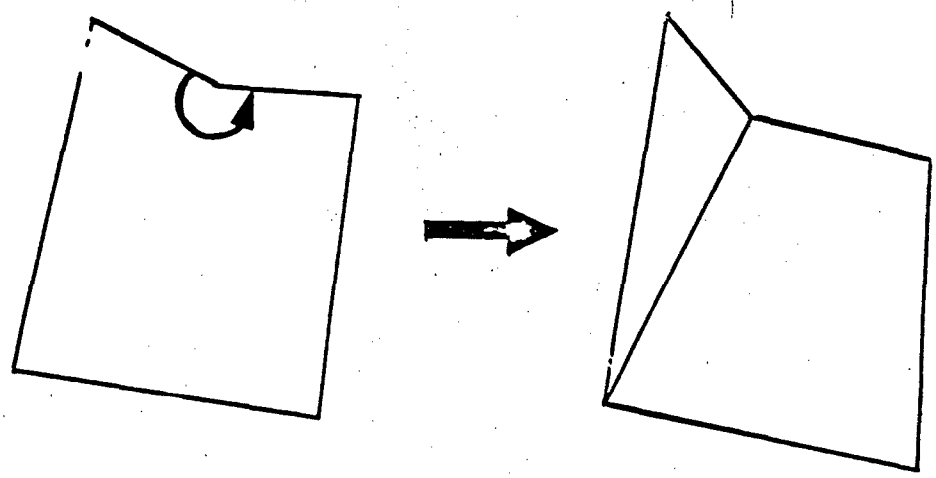
(3) Convex and Concave Figures. The following is an example a convex and a concave shape:

*NOTE: All points in the data record must be in standard 11 or 13 character coordinate formats to use the OVP operator. See the program documentation manual for descriptions of the subroutines CRDxS. These conversion subroutines can be used to change the format of the points for input or output.



CONVEX CONCAVE

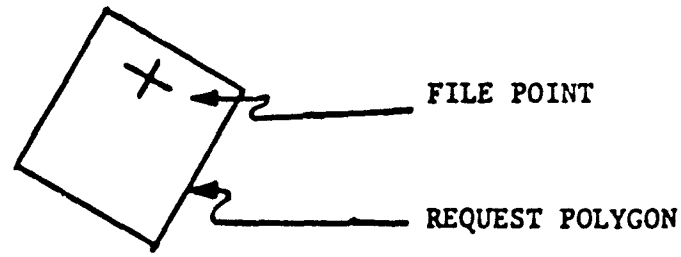
The concave figure can be divided into two convex figures and then described in two polygon searches.



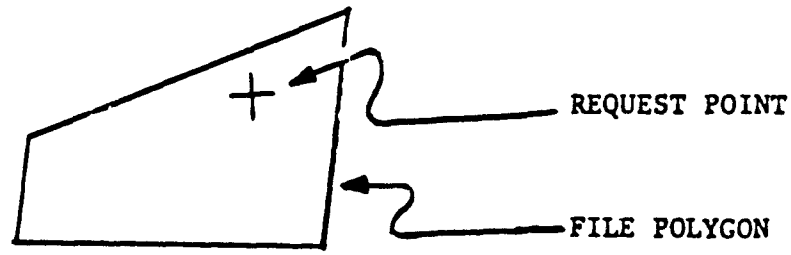
CONCAVE TWO CONVEX

(4) Types of Polygon Searches. The polygon operator will al the following searches:

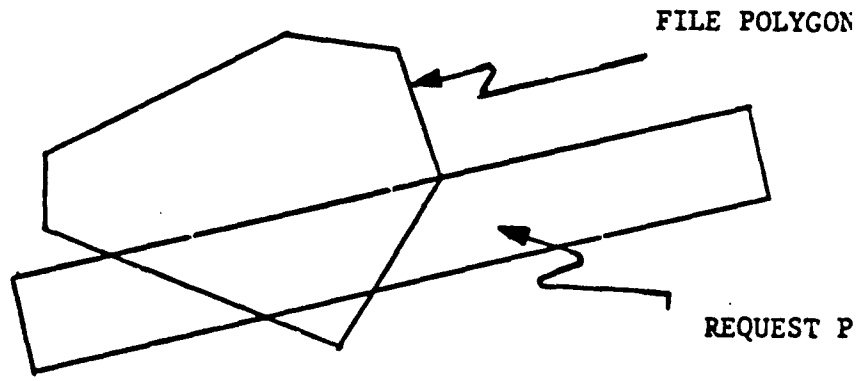
Request polygon versus point in file:



Request point versus polygon in file:

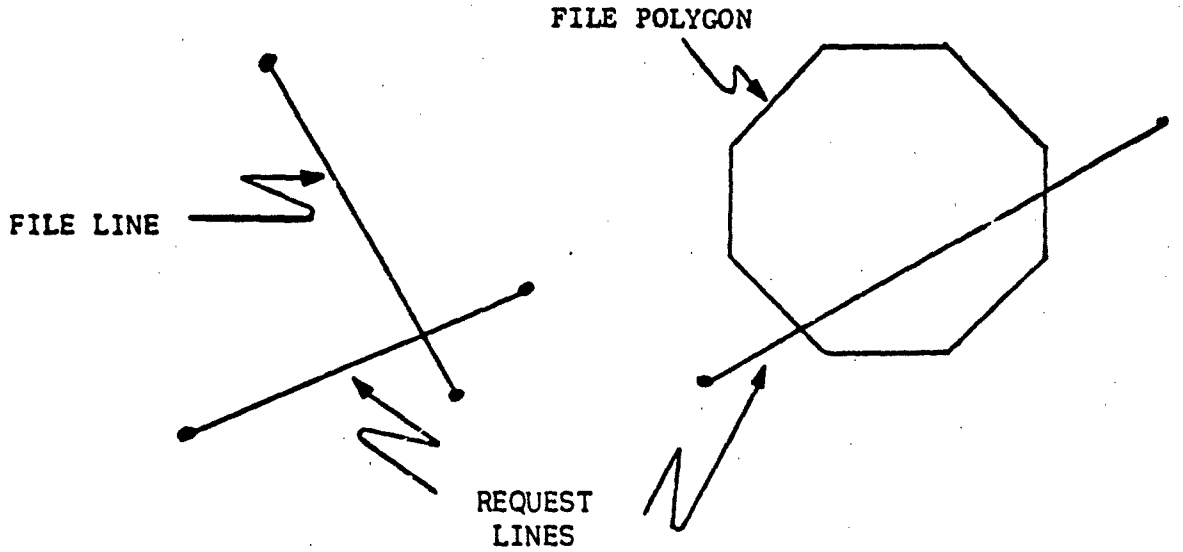


Request polygon versus polygon in file:



A point versus point comparison will also be executed - having the same effect as an equal comparison.

Considering a line a special case of a polygon, it is possible conduct a line versus line search, line versus polygon search, etc.



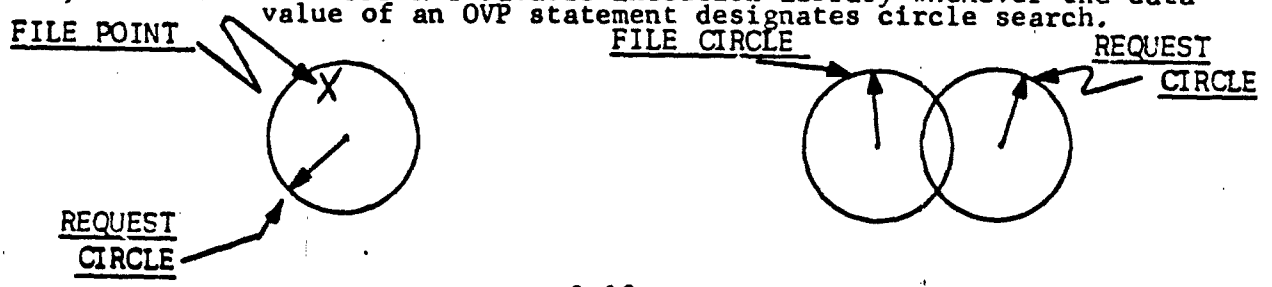
(5) Circle Search.

(a) The circle search operator may also be used in connection with the polygon. The circle search operator is used to determine if a value in a data record is within a specified distance of a point. For example,

IF,COORD,OVP,30,352516N0993545W,

would check to see if the coordinates of came within 30 miles of the coordinates specified in the query term. (See file point within request circle below.)

(b) It will be noted that the radius of the circle always precedes the coordinates. The radius is a four-character field. If the field is filled (0485) the number will represent miles and tenths (48.5 miles) or if the number is written in tenths (48.5) it will represent data in the same way. If only 485 is written it will be 485 miles without the decimal since the field is not filled. The subroutine X003S, which reformats radius, must be in the FFS Relocatable Execution Library whenever the data value of an OVP statement designates circle search.



(c) If the file contains the description of a circle, (radius and coordinates of a point) then an external circle can be (for intersection with a file circle.

IF,CIRKL,OVP,30,422530N1011625W,

Here CIRKL must be a field that contains radius and point coordinate or it must be a group with a field for radius and a field for point coordinates. A circle search against a file polygon would be speci in a similar manner.

(6) Special Geographic Operator.

(a) It is possible for a user to specify any other p polygon, polygon-circle or circle-circle relationship by means of hi subroutine. This subroutine, which must use the same format data fi and data value as that required for an OVP card, tells retrieval hit no-hit by means of an appropriate exit from the subroutine.

(b) Provision must be made for this special operator file structuring time if it is to be used. No special operator (ter used at retrieval time. (OVP is still used.)

(c) If the data value on the OVP card is a polygon (circle) and a special geographic subroutine exists, a subroutine may vert the polygon data value to a special input format for the geogra operator subroutine. This subroutine must be specified (in file gen tion) in input source 1 of the FIELD card of every field using the s subroutine.

NOTE: If a file that is structured for the special operator is quer in a multi-file query, the general geographic operator will not be available during that run for another file. The special operator su routine replaced the general operator subroutine for the run so the general will not be available.

3-4. RETRIEVAL FORMATS: Retrieval has two distinct formats for accessing data -- report and request.

a. The request is the most basic format of retrieval, is the easiest to understand; and, therefore, the easiest to use. It can b employed when:

A single question is directed against a single file.

The order desired for the retrieved data records can be accomplished by employing information contained in the dat records (if any ordering is required).

b. When a requirement cannot be satisfied by the request form the report must be employed. The report format allows:

A single question directed against a single data file. (NOTE: This duplicates the request format.)

Single questions directed against multiple-data files.

Multiple questions directed against a single-data file.

Multiple questions directed against multiple-data files.

Any ordering or merging techniques allowed by retrieval.

c. The report format's main usefulness comes about through the ability to order and merge data. For example, using the report format, it is possible to effect a "logical merging" of data records from different files, using information from similar fields for merging. Such merging cannot be done when employing the request format.

d. There may be a tendency to make data requirements seem more complex than they actually are. An information requirement that appears to require the use of the report format may often be broken into two or more entities that may employ the request format without a loss of meaning.

e. The component questions of a report are termed queries, and are much like a request in that they constitute a single question against a single file. A report may employ an unlimited number of queries. Section five will discuss the report and request formats in detail.

3-5. STANDING QUERY FILES: When retrieval requirements are originally submitted, they must be formatted on retrieval input forms. However, once the requests or reports are originally submitted, they will (upon instructions by the analyst) be maintained in tape or card files for future use. Thus, when an analyst desires a requirement to be rerun, he need only specify the identification that has been supplied to identify his report or request. This also makes possible the option of having retrieval requirements run "automatically." For example, if an analyst is looking for new data of interest, his requirements could be run after each entry of new data in a file.

3-6. REVIEW - TRUCTURE OF THE LANGUAGE:

a. The fields and groups in the data records have been assigned mnemonics and synonyms, which, when referenced, will refer to the data represented by the mnemonic or synonym.

b. The data value is the value supplied by the analyst with which the field or group is tested.

c. The relationship to be tested between a field or group and the data value is expressed with a relational or geographic operator.

d. The relationship between logical conditions or terms is est by logic connectors "IF" - "AND" - "OR."

e. A single logic condition, comprised of a logic connector, a field mnemonic or synonym, a relational or geographic operator, and a data value is called a term, which is the smallest unit in a logic expression.

f. The polygon operator will function only with a convex figur Concave figures may be divided into convex and then specified.

g. The circle search contains the radius of the circle followe by the coordinates of the point forming the center.

h. All fields in the data file against which the OVP operator, or its variants, are to be used must have points in standard 11 or 1: character coordinate format. Subroutines whose names are of the forn CRDxS can be used to change the format of the points for input or out put.

i. The subroutine ✱002S must be in the FFS Relocatable Execut: Library whenever a polygon data value is used with OVP.

j. The subroutine ✱003S must be in the FFS Relocatable Execut: Library whenever a circle data value is used with OVP.

SECTION FOUR

THE DEVELOPMENT OF LOGIC

The development of logic occurs on two levels:

The design of periodic sets and their influence on the logic.

The manner in which an analyst may fashion and group terms to create a compound expression.

4-1. FILE DESIGN AND LOGIC:

a. Fixed Set Information. It was stated earlier that within fixed set information there was no interaction between items of information. This fact means that an analyst need have no concern about possible data interaction when referencing fixed information.

b. Periodic Set Information. The opposite is true for periodic information, where there may be a meaningful interaction between data. For this reason, the analyst must understand the design and use of periodic information.

4-2. PERIODIC MODES: As part of the design of a file, a periodic set has a built-in "mode" or "logic flow" for logic conditions directed against the periodic set. These are:

INTRA Mode

INTER Mode

These terms basically define the logic flow, for INTRA means "within" and INTER means "between."

a. The INTRA Mode. In the INTRA mode (within), the information within a periodic subset has a strong interdependence. To demonstrate the interdependence of data in the INTRA mode, consider the following portion of periodic set one from the sample "Commercial Flight File."

LORIG	LTERM	OCOOR	TCOOR	LXOFY	TDATE	TTIME
CHICAGO	DENVER	420220N0873145W	394515N1045315W	35	08	0800

SUBSET #1

Figure 4-1. Periodic Set - INTRA Design (continued on page 4-2).

LDATE	LTIME	ALTTD	ONBRD	FUELL	GROWT	LORIG	LTERM
6608	0900	270	98	250	2600		

SUBSET #1 (Continued) SUBSET #2

Figure 4-1. Periodic Set - INTRA Design

For each airline represented in the "Commercial Flight File," a data record appears for every route that each airline flies. For a given route, the following information is maintained in a periodic set:

Leg Origin
Leg Termination

Geographic Reference
  Leg Origin Coordinates
  Leg Termination Coordinates

Leg X of Y

Takeoff Date and Time
  Takeoff Date
  Takeoff Time

Landing Date and Time
  Landing Date
  Landing Time

Average Altitude
Cargo or Passengers Onboard
Fuel Loaded at Leg Origin
Gross Weight at Leg Origin

This means that if this is a record of a reported flight between New York City and Los Angles on a given date, there would be as many periodic subsets as there were legs of the flight. The example of the subset above is for the flight leg originating at Chicago and terminating in Denver.

(1) The information in one subset is completely independent of information in the other subsets, even though they all contain the same type of information. However, within the subsets there is a strong relationship, for the departure and arrival times pertain only to that particular flight, with that flight number, on that day, with that aircraft. This

periodic set should imply the INTRA mode, because of the relationship of data within each periodic subset.

(2) The implication of the INTRA Mode on logic terms directed against a periodic set employing this mode is:

> All consecutive terms against the periodic must be satisfied in one subset.

For example, the condition:

> IF,TAKEOFF-DATE/TIME,EQUALS,080800,
> AND,LANDING-DATE/TIME,EQUALS,080900,

will be meaningful only if both terms are satisfied in one subset.

b. The INTER Mode. The INTER Mode approaches the converse of the INTRA Mode. The implication of the INTER Mode on logic is:

> All consecutive terms against the periodic set must each be satisfied by at least one subset.

Drawing from the sample "Airport File," periodic set two contains the names of all airlines using terminal. (See section two.)

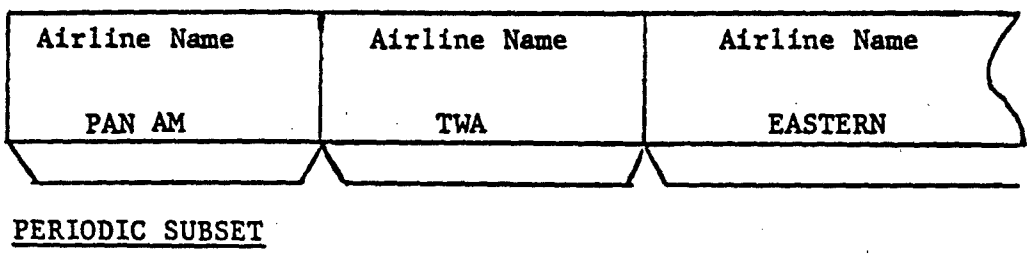


Figure 4-2. Periodic Set - INTER Design

Each periodic subset in periodic set two contains the name of an airline using the terminal. It would be meaningless to require that all consecutive terms be satisfied in one subset, and would, in fact, be impossible. For example:

> IF,AIRLINE,IS EQUAL TO,TWA,
> AND,AIRLINE,IS EQUAL TO,PAN AM,

It would be impossible to satisfy the condition if the periodic set employed the INTRA Mode (all consecutive terms satisfied in one subset), for if "TWA" is in one subset, it is obvious "PAN AM" cannot be in the same subset.

4-3. SELECTING THE MODE: The logic mode for a periodic set is "built in" to the file, and is specified on the "File Description - Retrieval" for each periodic set. The assigned mode will be employed unless the analyst alters the mode.

a. Altering the Mode. The logic mode of a periodic set may be overridden by use of an "override" card which specified the logic mode desired by the analyst. (Reference section five for "override" card format.)

b. Interrupting the Mode. The INTRA Mode, by the very nature of its definition, creates a problem. That is, it may be desirous to state which consecutive terms are to be satisfied in one subset. For instance, in the INTRA Mode example, assume it was of interest if an airline had a flight originating at New York City and terminating in Los Angles on the 15th of the month. It had interim stops at Pittsburg, Chicago, Denver, and Las Vegas. If we want to know if the flight had a takeoff from Pittsburg and landing at Denver, we must examine two different subsets within the same periodic set.

```
IF,LEG-ORIGIN,EQUALS,PITTSBURG,
AND,TAKEOFF-DATE,EQUALS,15,.
AND,LEG-TERMINATION,EQUALS,DENVER,
AND,LANDING-DATE,EQUALS,15,
```

This condition could not be satisfied if all terms were required to be satisfied in a single subset. What is desired is to have the first and second condition satisfied in one periodic subset, and the third and fourth satisfied in any other subset.

(1) The period (.) following the second term in this example communicates this requirement to retrieval.

(2) The period's only function is to break the INTRA Mode, allowing the following term to be satisfied in any subset.

4-4. VARIATION OF INTRA LOGIC: The variations of INTRA logic have little effect on the logic of retrieval, but are of great importance to the printing of the data record after it is retrieved. These variations are:

Scan Mode

Non-Scan Mode

Terminate Mode

a. Scan Mode. In the scan mode of INTRA logic, all subsets which satisfy the logic condition are "flagged" or tagged with an indicator showing all subsets which satisfied the logic conditions. If this mode

of logic is employed, the analyst may specify for output the printing of the "flagged" subsets only.

b. Non-Scan Mode. The non-scan mode of INTRA logic simply checks until a subset satisfies the logic condition, and then stops checking the remaining subsets in the record. No subsets are "flagged."

c. Terminate Mode. The terminate mode is much like the scan mode with one exception. It checks subsets until it finds one that satisfies the logic condition. It continues checking and "flagging" subsets until one fails, at which time checking is discontinued. The main use of the terminate mode is to save computer retrieval time. However, it may have some logical applications not yet identified.

4-5. FASHIONING THE LOGIC CONDITION: It is not meant to underplay the importance of the problem analysis that precedes the stating of the retrieval logic, for this step indeed is the most important step. However, the procedures to analyze a problem are as varied as the problems themselves. Therefore, let it suffice to say, that no matter how expert an analyst is at formatting retrieval logic, if the condition he is formatting is incorrect, then the results will reflect the incorrectness of the analysis.

a. Logic Expressions. There are two basic levels of stating logic expressions:

Simple Logic Expression

Compound Logic Expression

(1) A simple logic expression employs only one term. This term must start with an "AND" (or "IF") connector.

(2) The compound logic expression is comprised of two or more terms, which may be linked by "AND" and "OR" connectors. These conditions may also be combined into parenthetical expressions. The first logic connector of a compound expression must also be an "AND" (or "IF") connector. The following paragraphs will discuss the rules of logic execution using the "AND" and "OR" connectors.

b. Logic Execution. Retrieval examines the logic terms of a compound expression in the following manner:

(1) If an "AND" term is satisfied, the following "OR" terms are not checked. The next term to be checked is another "AND" term.

(2) If an "AND" or "IF" term is not satisfied, succeeding "OR" terms are checked until one is satisfied. The remaining "OR" terms are not checked, and the next term to be checked is the next "AND" term.

(3) If an "AND" term is not satisfied, and no "OR" term is satisfied prior to another "AND" term or the end of the expression, the condition fails.

(4) If the end of the logic condition is reached, and the preceding "AND/OR" group is satisfied, the logic condition is satisfied.

c. Parenthetical Expression. The last logic tool to be introduced is the parenthetical expression. The parenthetical expression is used when it is desired to test a group of terms together. Only a single level parenthetical expression may be employed. For example, again consider a logic requirement against the sample "Commercial Flight File." The problem is to require all data records for flights originating in New York City and terminating in San Francisco, or originating in Chicago and terminating in Los Angeles. Both left and right parentheses are denoted by *.

```
IF,*FLIGHT-ORIGIN,EQUALS,NEW YORK CITY,
AND,FINAL-DESTINATION,EQUALS,SAN FRANCISCO,*
OR,*FLIGHT-ORIGIN,EQUALS,CHICAGO,
AND, FINAL-DESTINATION,EQUALS,LOS ANGELES,*
```

If these same terms were given without the parens, the meaning would have been different. This would try for records with flights originating in New York, and terminating in San Francisco or originating in Chicago, and terminating in Los Angeles. These conditions could not be satisfied in one data record.

(1) It may be interesting to note that the terms within a parenthetical expression follow the same rules as the total logic expression. That is, the second parenthetical clause may be interpreted:

```
OR,(IF,FLIGHT-ORIGIN,EQUALS,CHICAGO,
    AND,FINAL-DESTINATION,EQUALS,LOS ANGELES,)
```

(2) The initial connector of the terms within a parenthetical expression is assumed to be an "AND" as it would be meaningless to start the expression with an "OR." The connector starting the parenthetical expression is the connector of the entire expression. Some points to note concerning parenthetical expressions:

(a) The interior of a parenthetical expression is examined like an entire expression.

(b) In determining if a compound expression is satisfied which employs a parenthetical expression, the entire parenthetical expression is treated as a term, as to being satisfied or not satisfied.

d. Examples of Compound Logic Expressions:

Compound Expression	Interpretation
If A and B	Both A and B must be true.
If A or B	Either A or B or both must be true
If A or B and C	C must be true. Either A or B or both must be true.
If A or (B and C)	Either A must be true or B and C must be true.
If A and B or C	A must be true. B or C or both must also be true.
If (A and B) or C	A and B must be true or C must be true.
If A or (B and C) or D	Either A must be true or B and C must be true, or D must be true. (or all)

4-6. REVIEW - DEVELOPMENT OF LOGIC: The mode of logic assigned to periodic sets affects the logic terms applied to the periodic set.

a. INTRA Mode - all consecutive terms against the periodic set must be satisfied in the same subset.

b. INTER Mode - each term against the periodic set need be satisfied only by at least one subset.

c. The periodic set mode is carried within the field, and specified on the "File Specification Sheet - Retrieval."

d. The periodic set mode can be altered by use of the "override" card, or in the case of the INTRA Mode, be interrupted by use of a period in the logic statement.

e. A single level parenthetical expression is allowed in stating a retrieval requirement.

4-7. CROSS INDEX

a. Retrieval Without a Cross Index. Each term of a request or query (search) must be passed against each data record of the file being processed to insure that all records which satisfy the search are retrieved. Consider the following search against the Commercial Flight File:

IF,FINAL-DESTINATION,EQUALS,LOS ANGELES,
AND,FLIGHT-ORIGIN,EQUALS,NEW YORK,

Without a cross index each record in the Commercial Flight File must be accessed and examined to determine if it satisfies the above logic statements. This method of serial searching is time-consuming and, when searching a large data file, could result in unsatisfactory retrieval times.

b. Cross-Index Function.

(1) The cross-index capability was developed to eliminate the necessity of always serially searching data files.

(2) A cross index is a table in which the table argument contains a field value or condition; the function values are record ID groups (field or group of fields which uniquely identify a data record) of data records which satisfy that condition.

(3) Particular fields within a data record are more frequently employed as search criteria than are others. Maintenance of a cross index to such a field enables retrieval, when it encounters the field in a search, to select for processing only those records associated with the particular value of the field stated in the search.

(4) Consider, again, the preceding example against the Commercial Flight File:

IF,FINAL-DESTINATION,EQUALS,LOS ANGELES,
AND,FLIGHT-ORIGIN,EQUALS,NEW YORK,

If the "FINAL-DESTINATION" field were cross-indexed, retrieval programs would extract the data field value (LOS ANGELES) and, from the cross index determine the record ID groups (FLIGHT) of all records which contain the value "LOS ANGELES" in the "FINAL-DESTINATION" field. Subsequent retrieval programs would then pass this search against only those data records whose record ID groups were retrieved from the cross index.

(5) For an example of a cross-index table refer to Figure 4-3.

c. Eliminating Record ID Groups From Consideration Prior to Accessing the Data Records. When "LOS ANGELES" is passed against the Commercial Flight File Cross Index (CMFLX-Figure 4-3) the following record ID groups are retrieved:

1.	AMERICAN	NEW YORK	6501080550
2.	NORTHWES	MINNEAPOLIS	6501080750
3.	UNITED	CHICAGO	6501080905
4.	UNITED	NEW YORK	6501080640
5.	WESTERN	DENVER	6501081000

If a search which references a cross-indexed field also references a field which is contained within the record ID group for the file, it becomes possible to eliminate some of the record ID groups retrieved from the cross index. Note that the preceding search also references "FLIGHT-ORIGIN" which is part of the record ID group for the Commercial Flight File. Retrieval is now able to eliminate all those record ID groups retrieved which do not contain "NEW YORK." When this elimination is performed only record ID groups 1 and 4 remain. This search need now be passed against only two data records which are already uniquely identified by their record ID groups.

NOTE: Elimination data fields may not exceed 15 characters.

d. Utilization of a Cross Index. If the file specification sheet indicates a cross index exists for a file, minimal retrieval times can be realized by including the cross-indexed parameter in each request or query. A cross-indexed parameter may be referenced up to three times in one request or query.

SAMPLE CROSS INDEX TABLE - (CMFLX)

COMMERCIAL FLIGHT FILE - (CMFLA)

Table Argument: FINAL DESTINATION	Table Functions: RECORD CONTROL GROUP		
LOS ANGELES	AMERICAN	NEW YORK	65C
	NORTHWES	MINNEAPOLIS	65C
	UNITED	CHICAGO	65C
	UNITED	NEW YORK	65C
	WESTERN	DENVER	65C
	ETC.		
SAN FRANCISCO	EASTERN	NEW YORK	65C
	NORTHWES	CHICAGO	65C
	NORTHWES	ST. LOUIS	65C
	PAN AM	PITTSBURG	65C
	UNITED	NEW YORK	650
	ETC.		
SEATTLE	AMERICAN	NEW YORK	650
	DELTA	NEWARK	650
	EASTERN	NEW YORK	650
	NORTHWES	CHICAGO	650
	TWA	ST LOUIS	650
	UNITED	DETROIT	650
	ETC.		

Sample Cross-Index Explanation

The Commercial Flight File is Cross-Indexed o "FINAL-DESTINATION" field. The Cross-Index is a t which contains a table argument for all possible v of the "FINAL-DESTINATION" field - i.e., (LOS ANGE SAN FRANCISCO, SEATTLE, etc.). The functions of e argument are Record ID Groups which identify each which contains the table argument value.

Figure 4-3. Sample Cross-Index Table

SECTION FIVE

RETRIEVAL FORMATS

Retrieval has two basic formats, report and request, with which the a may state his retrieval requirements. Each has its specific use, and has a reference form to guide the analyst in stating requirements to retrieval. In this section, each format is discussed under the follo topics:

Uses of the format.

Reference forms.

Card order.

5-1. THE REQUEST FORMAT:

a. Uses. The request format may be employed when the followin conditions are met:

(1) A single question is directed against a single data fi

(2) If ordering is required for the resulting answers, it be accomplished by using data fields in the answer records.

b. EDP Request Form. (Figure 5-1.) The request form is used state the user requirements in the retrieval language. This reference form is divided into two areas: identification information and card layout.

(1) Identification Section. The following items serve as control or identification information for the request form. Some of these items are punched into columns 71-80 of every card generated fr the card layout.

(a) The analyst, file name, and page number entries o the upper left of the form are self-explanatory.

(b) Plot - if the file being queried is a photographi file, the user may or may not wish his output plotted (if plotting fe is available).

(c) File Numeric - the file numeric is a two-characte numeric value assigned to the data file. This number could be a permanently assigned number or it could be assigned at run time. It must remain constant through the retrieval run. It is used as a majo sort field for the machine sort prior to running. This number is pun into columns 71-72 of each card. It is not assigned by the analyst.

(d) Group ID (Request Number). A two-character numeri which will be punched in columns 73-74 of each card of the request. will be unique within a retrieval run. It serves to identify all car one request.

ANALYST J JONES

FILE NAME CMFLA

PLOT? YES ☐

NO ☒

PAGE ___ OF ___

IDHS/FFS

EDP REQUEST ORM

FILE NUMERIC 17

GROUP ID 01

SEARCH NO. 0001

SEQUENTIAL NUMBERING COL 79-80

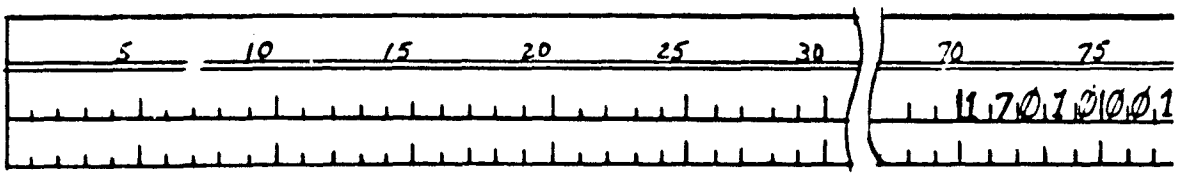
DIAM 65-9-2

RFTID	LOG NO.	ANAL. CODE	COMMENTS	RUN NO	DATE D M Y	
REQUEST	A001	R		1	15035	01
			COMMENT CARDS HAVE "*" IN COL 1 FIRST LOGIC CARD FOLLOWS COMMENT CARDS, STARTING WITH 'IF' IN COL 1			
IF,AIRLINE,IS EQUAL TO,AMERICAN,						02
OR,AIRLINE,IS EQUAL TO,UNITED,EASTERN,						03

(e) Search Number (Query Number). A four-character number which identifies a question (a request or a query). Each request and each query must have a unique search number. It is punched into columns 75-78 of each card.

(f) Card Sequence Number. A two-character number which will sequentially number each card of the request group starting with the number Ø1. (Col 79-80)

(2) Card Layout. Each line of the form is used to generate one punched card. The information is punched into columns 1-69 of the card. Columns 71-80 contain information from the identification section of the request form. This identification information (col 71-80) remains the same for each card except columns 79-80 which are sequentially numbered for each card.



Col 71-72	File Numeric
Col 73-74	Request Number
Col 75-78	Search Number (Query)
Col 79-80	Card Sequence Number

Figure 5-2. Identification Section of each Request Card

(a) Request Card. The request card initiates each request group and serves to specify the output format and to identify the report.

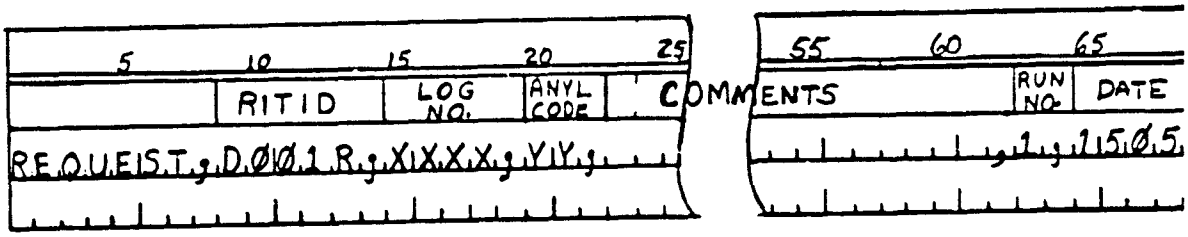


Figure 5-3. Request Card

Cols 9-13 - RITID. This specifies the output format to be used when outputting the resultant answer records.

Cols 23-62. Comments in free text. All other columns are self-explanatory

(b) Comments Card. The comments card is used to supply free text comments. There is no limit to the number of comment cards allowed. An asterisk (*) must appear in column 1 of each comment card. These cards serve to identify or add clarity to the printout which occurs at run time.

```
    5        10        15        20        25        30        35        40
*, THIS, IS, A, COMMENTS, CARD.
*, FREE, TEXT, IS, ALLOWED.
```

Figure 5-4. Comments Card

(c) Logic Cards. Logic cards are used to state the logi parameters a data must meet before it is retrieved. A logic term must b contained on one card except for a Polygon Search term which is limited to three cards. Each logic term has four items:

1. Logic Connector - "IF" - "AND" - "OR"

2. Field Name - Synonym or mnemonic (from File Specification Sheet - Retrieval).

3. Relational Operator - The list of relational operators and vocabulary are found in section three.

4. Data Value - The value with which the logic comparison is made.

Each of these items must be separated by a comma. The term may start in any of the first three positions on the line.

```
    5        10        15        20        25        30        35        40
IF, AIRLINE, IS, EQUAL, TO, AMERICAN,
OR, AIRLINE, IS, EQUAL, TO, EASTERN,
```

Figure 5-5. Logic Cards

A review of the general rules of logic is found at the end of this secti

(d) Sort Card (Optional). The sort card is used to specify the fields that the answer records are to be sorted by.

1. Following the word "SORT" are the synonyms or field mnemonics of the data field to supply sort information. These fields may be in the fixed or periodic sets. The order in which the fields are specified indicates the order of the sort. Only one periodic field may be placed on the sort card in a request or query form. (See pages 6-[illegible] and 6-10.) In this case, the periodic field utilized as a sort field must reside in a set which has been assigned the INTRA, SCAN MODE.

2. A maximum of 25 data characters may be included as sort information. If the analyst specifies data fields for sort that, when totaled, exceed 25 characters, retrieval will employ only the first 25 characters specified.

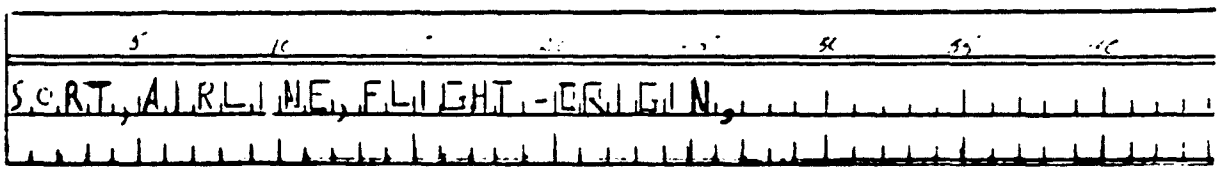


Figure 5-6. Sort Card

(e) Override Card.

1. The override card is used to change the "built-in" logic mode assigned to a periodic set. The override card changes the mode only for the request or query group with which it is used. Up to three periodic sets may be referenced on one card.

2. A two-character set specifies the periodic set to be changed and the logic mode to be assigned.

3. The logic mode abbreviations are:

S - Scan
N - Non-Scan
I - Inter-Scan
T - Terminate

For explanation of the modes, reference "Periodic Set Information," section four.

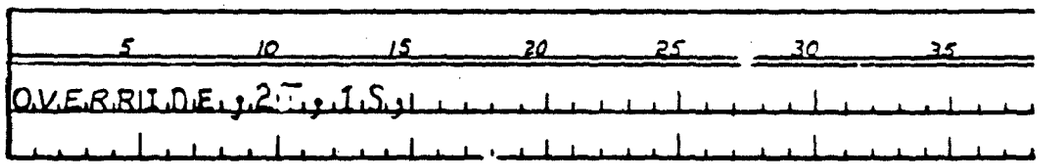


Figure 5-7. Override Card

This example states:

Override Periodic Set Two, and assign the Terminate Mode.

Override Periodic Set One, and Assign the Scan Mode.

(3) Request Card Order. The following order must be maintained:

REQUEST Card - mandatory
COMMENT Cards - any number, optional
LOGIC Cards - the first LOGIC Card must begin with "IF" or "AND." Any number.
SORT Card - optional
OVERRIDE Card - optional

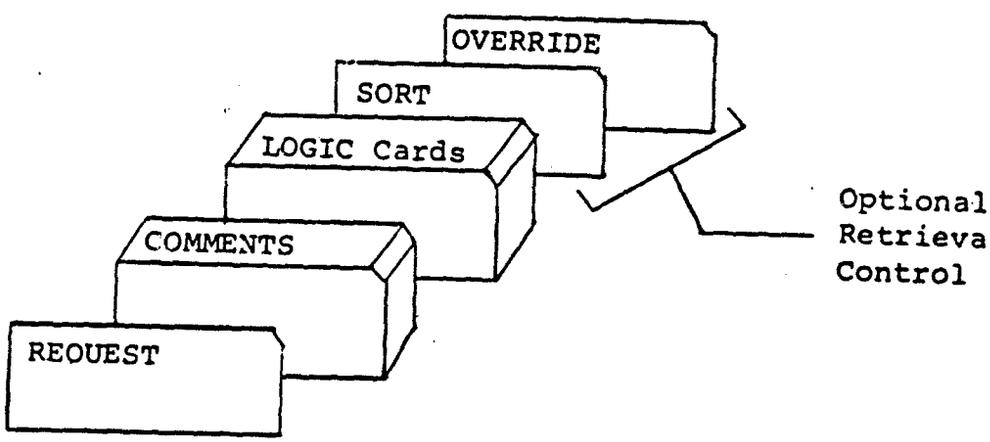


Figure 5-8. Card Deck for Request

Requests may be batched. Each request must have a unique group numbe unique search number.

ANALYST J. JONES

FILE NAME CMFLA AIRVA

PLOT? YES ☐

NO ☒

IDHS/FFS

EDP REPORT HEADER FORM

FILE NUMBER [illegible]

GROUP ID Ø3.

PAGE ___ OF ___

SEQUENTIAL NUMBERING COL 79-80

RFTID	LOG NO.	ANAL. CODE	COMMENTS	RUN NO	DATE D M Y	
REPORT	BØØ1	R		2	15Ø35	Ø1
			* THIS REPORT WILL RETRIEVE ALL RECORDS OF AIRPORTS IN CHICAGO			Ø2
			* AND NEW YORK, AND RECORDS OF FLIGHTS TO EITHER CITY FROM DENVER			Ø3
			*			
			*			
			*			
			*			
			*			
			*			
			INQUIRING AIRVA, CMFLA,			

REPORT FORMAT TO BE EMPLOYED WHEN:

1. MORE THAN ONE RELATED SEARCH IS DIRECTED AGAINST ONE OR MORE THAN ONE FILE.
2. THE ANALYST WISHES TO PERFORM MULTIFILE MERGING OF ANSWER RECORDS.

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5-2. REPORT FORMAT:

a. Uses. The report format may be used when:

One or more questions are being directed against one to files.

Any merging and/or ordering techniques allowed by retrie required.

The report format is divided into two groups:

Report Header Group (figure 5-9)

Queries

b. Report Header Form. The report header form (figure 5-9) retrieval and output control information that pertains to the enti

(1) Identification Section. The following information as the report identification.

Analyst, File Name and Plot - Reference "Request Format, Identification Section."

File Numeric - Because the Report Header Group does not pertain to any particular data file, the File Numeric in all Report Header Groups is "00" (col. 71-72).

Group ID - A unique two-digit number which serves to identify the report (col. 73-74). It must be different report and request in a run.

Sequential Numbering - A two-character number which seria numbers each card within the Report Header Group (col. 79

Note - Columns 75-78 are not used.

(2) Card Layout. Each line of the report header form wi punched into a retrieval card in columns 1-70. Columns 71-80 of ea card will contain information from the identification section.

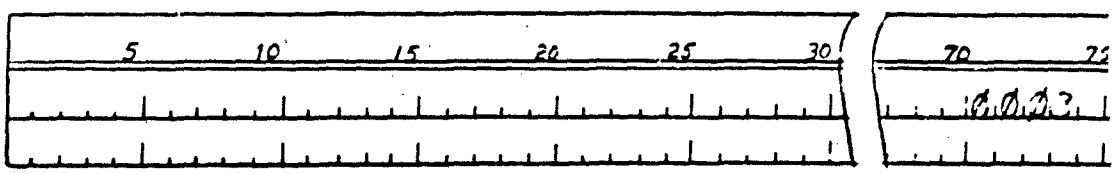

Figure 5-10. Identification Section of Each Report Header Card.

(a) Report Header Card. The report card initiates each report header group and serves to specify the output format and to identify the report.

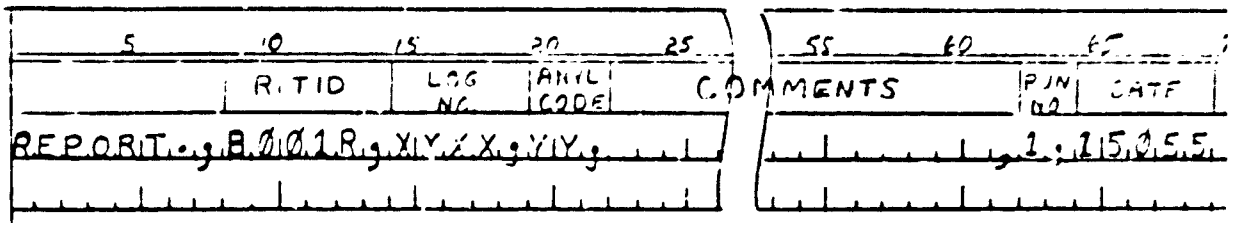

Figure 5-11. Report Header Card

This card serves the same purpose as the request card in the request format. Columns 9-14 are used to specify an output format.

(b) Comments Card. The comments card is used to supply free text comments. Refer to "Comments Card" in this section under "Request Format" (subparagraph 5-1.b.(2)(b)).

(c) Inquiring Card. Every report must have an inquiring card, stating all the files queried by the report, and the desired file order. The inquiring card supplies the value for the file sequence number in the answer record sort key. (Reference "The Sort Key," section six.) It specifies the order in which files for a multifile report will appear on the printed page, or specifically the order data files will appear in a physical or logical group. A maximum of ten files may be specified on an inquiring card. Following the word "INQUIRING" are the five-character mnemonics of the files to be queried for the report, each separated by a comma. The relative sequence of the file mnemonic on the card specifies the relative order in which the files will appear.

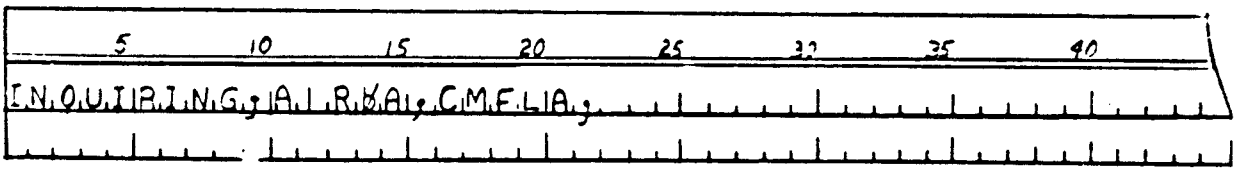

Figure 5-12. Inquiring Card

This example specifies that the "AIRØA" and "CMFLA" files are required for this report, and the answers within a logical or physical group are desired in order of "AIRØA" answers first, "CMFLA" answers second.

(3) Card Order - Report Header Group. The following card order must be maintained:

REPORT HEADER Card - mandatory
COMMENTS Cards - Any number - optional
INQUIRING Card - Mandatory

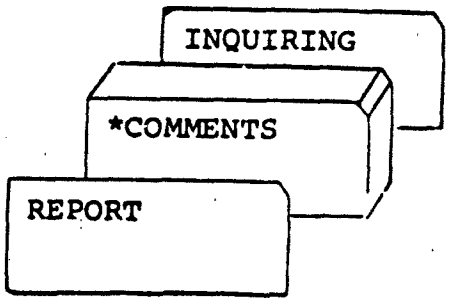

Figure 5-13. Card Deck for Report Header Group

In printing the answers to a report, only the report card and comme carried in the report header group are printed prior to the answers

c. Query Form. The component questions of a report are call queries, and each query of a report is formatted on the query form (figures 5-14, 5-15). The query format and purpose is almost ident to the request form at.

(1) Identification Section. The identification section query form is identical to that of the request form with the follow exceptions:

Group ID - The group ID (report number) will be the value as the group ID assigned to the associated rep header groups.

Search Number. The search number or query number be different for every query and request in the ru

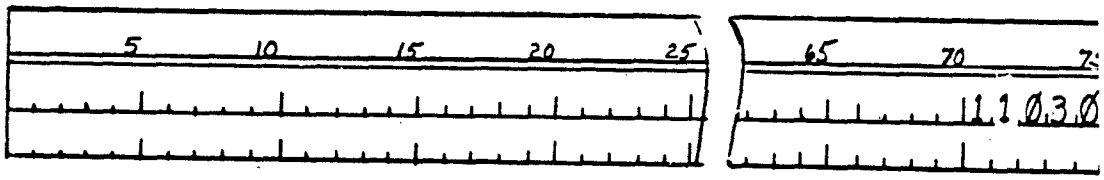

Figure 5-16 Identification Section
of Each Query Card

(2) Card Layout for Query.

(a) Query Card. Each query must be initiated with a query card.

ANALYST J. JONES

FILE NAME AIRØA

PLOT? YES ☐

NO ☒

PAGE ___ OF ___

IDHS/FFS

EDP QUERY FORM

FILE NUMERIC 11

GROUP ID Ø3

SEARCH NO ØØØ1

SEQUENTIAL NUMBERING COL 75-80

COMMENTS

```
QUERY,                                                    Ø1
IF,CITY,EQUALS,CHICAGO,                                   Ø2
OR,CITY,EQUALS,NEW YORK,                                  Ø3
SORT,CITY,AIRØA,                                          Ø4
```


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ANALYST J. JONES
FILE NAME CMFLA
PLOT? YES ☐
NO ☒
PAGE ___ OF ___

IDHS/FFS
EDP QUERY FORM

FILE NUMERIC 17
GROUP ID Ø3
SEARCH NO. ØØØ2
SEQUENTIAL NUMBERING COL 79 80

DIAM 65-9-2

COMMENTS

```
QUERY.                                                          Ø1
IF.FLIGHT-ORIGIN,EQUALS,DENVER,                                 Ø2
AND,FINAL-DESTINATION,EQU,CHICAGO,                              Ø3
OR,FINAL-DESTINATION,EQUALS,NEW YORK,                           Ø4
SORT.FINAL-DESTINATION,CMFLA,AIRLINE.                           Ø5
```

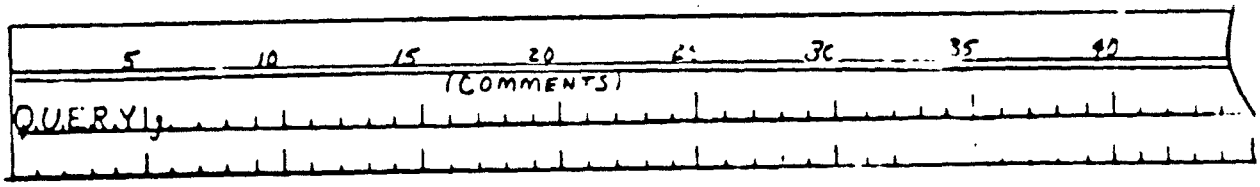


Figure 5-17. Query Card

Columns 7-70 may be used for comments.

(b) Logic Card. The logic card will be identical to the one used with the request format. A review of logic cards is found at the end of this section.

(c) Sort Card. The sort card for a report is identical to the sort card for a request, except for the ability of the report sort card to be used to reposition the file sequence number. In a "report" the sort card can be used to reposition the file sequence number by referring to the current file for the "report" against which the query is being directed. For a detailed description of the effects of repositioning, see "File Sequence Number," section six, subparagraph 6.2.d.

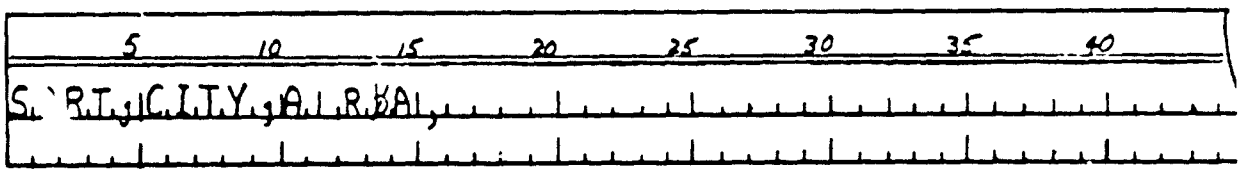


Figure 5-18. Sort Card,
Reposition File Sequence No.

If AIRØA is the file mnemonic of the file against which the current query is being directed, the file sequence number will be relocated in the sort key after the "CITY" value from the answer record.

(d) Override Card. The override card for a report is identical to the one discussed in the request format.

NOTE: The sort and override cards, if needed, are only used with the first query of a report against a particular file. The sort and override will apply to all subsequent queries of the report against that file.

d. Query Card Order. The following card order must be maintained: (See figure 5-19.)

QUERY Card - Mandatory

LOGIC Cards - First logic card must start with "IF" or "AND" - Mandatory

SORT Card - Optional

OVERRIDE Card - Optional

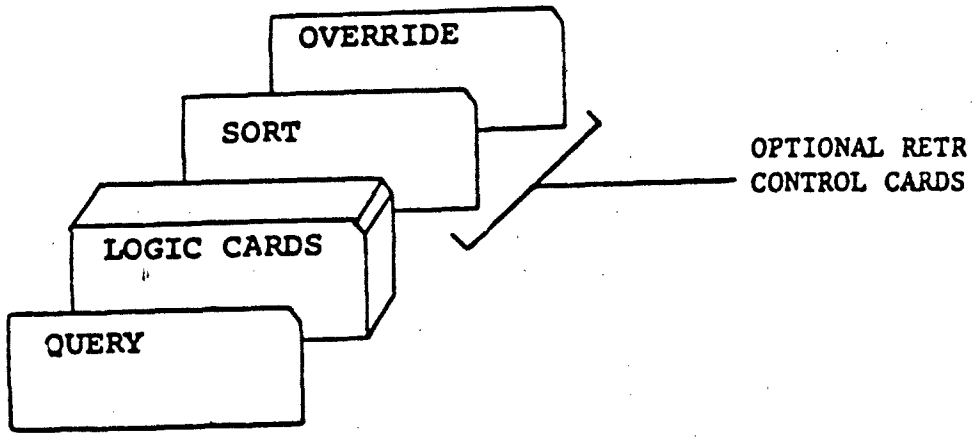


Figure 5-19. Card Deck for First Query

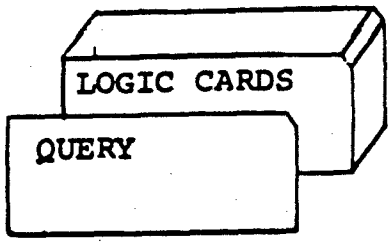


Figure 5-20. Card Deck for all Other Queries

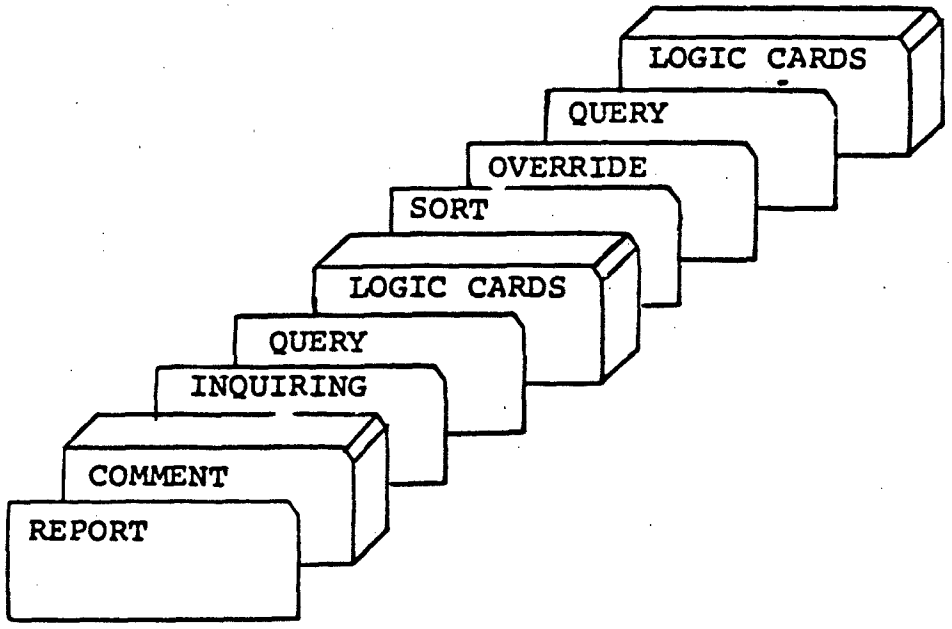


Figure 5-21. Complete Card Deck for a Report

5-3. SPECIAL RETRIEVAL CARDS: The following cards are used only by the retrieve technicial and/or his computer operator.

a. File Card. The file card is inserted before all requests and queries for a file. The word "FILE" is followed by the file mnemonic. Also the file numeric must appear in columns 71-72.

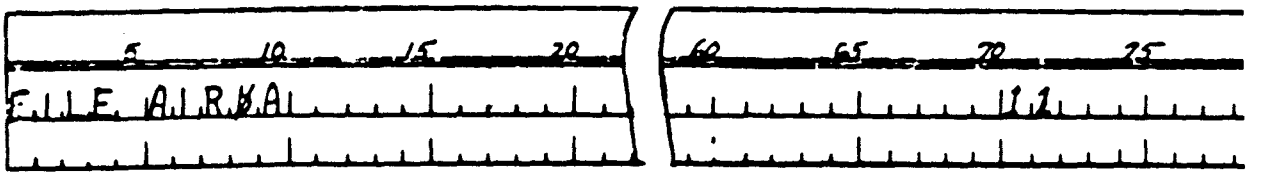


Figure 5-22. File Card

b. End Card. The end card must follow all of the other retrieval cards for a retrieval run.

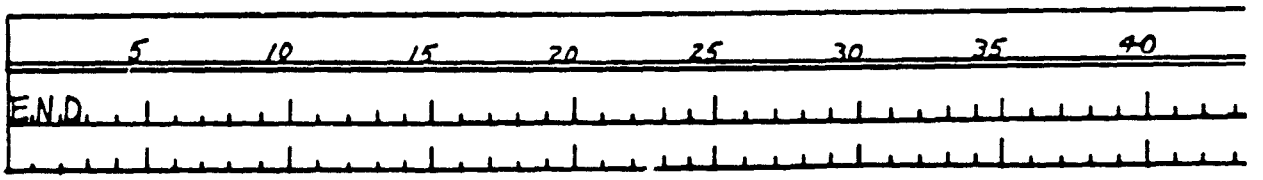


Figure 5-23. End Card

c. Retrieval Control Card (RCC). This card is the first card of the retrieval control card group, and follows the execute retrieval card. The run compiler will supply the card to the operator. It is used to indicate the source of the query or to specify SORT if the sort phase only is to be run. See figure 5-24.

5-4. GENERAL RULES FOR LOGIC CARDS: These rules are applicable to logic cards used in both the report and request formats.

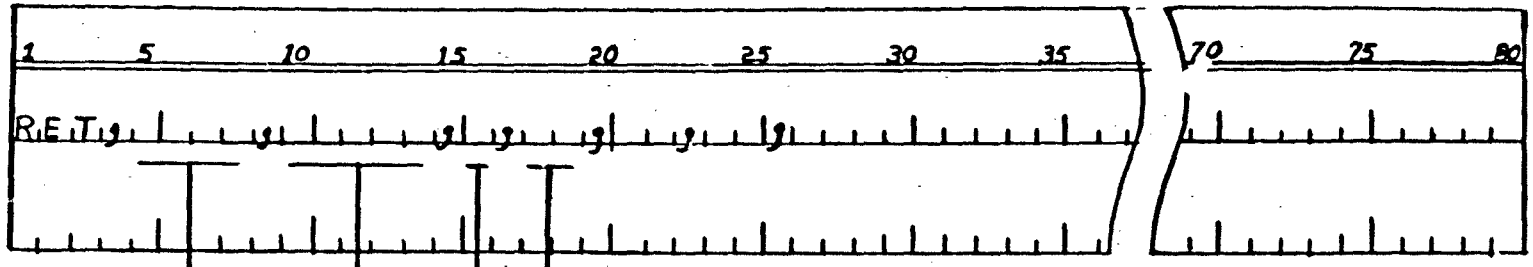
a. Logic Connector.

(1) The "IF" and "AND" logic connectors have the same meaning.

(2) The first logic connector in the logic expression must be "IF" or "AND."

(3) The rules concerning the employment of logic connectors will be found under "Fashioning the Logic Condition" in section four.

(4) The logic connector must begin in columns 1, 2, or 3.



If column 16 = "S" columns 18-80 will contain the Group ID's of the REQUESTS/REPORTS to be processed - each ID is followed by a comma.

"S" if selective querying
"N" if non-selective querying

Column 16 is used only with the query tape.

"NNNNN" If card input, this number is placed in the query tape header label. If tape input, this is the number of the query tape to be used.

"CARD" if card input (card columns 10-80 must not be used).
"TAPE" if tape input (query tape).
"SORT" if Sort Phase only is to be run.
"EDIT" if Retrieval is to be terminated after Input Editor is run.

b. Element Name.

(1) The field mnemonic or synonym may be used to reference a data field in the file.

(2) No differentiation need be made between field and group mnemonics or synonyms.

c. Relational Operator.

(1) In stating relational operators, only key words need be employed.

(2) Relational operator key words are found in section three

(3) The description of possible relational operators will be found under "relational operators" in section three.

d. Data Value.

(1) The data value is the item with which the location in the data record specified by the mnemonic or synonym is tested.

(2) The data values applicable to specific data files are listed on the "DETAILED DESCRIPTION" for each data file.

(3) Numeric data values are automatically padded on the left with zeros if they are short, and truncated on the right if long.

(4) Alpha data values are padded on the right with blanks if short and truncated on the right if long.

(5) Special handling for data values, if required, will be noted on the particular file's "DETAILED DESCRIPTION - RETRIEVAL."

(6) If the data value supplied is to be blank, the word "BLANK" must appear as the data value on the card. Retrieval will supply the necessary number of blanks.

(7) A dollar sign ($) may be placed in the data value, and specifies that any character will satisfy at the position of the dollar sign in the data value. A $ may not be placed in a cross-indexed data value.

e. Multiple Data Values. It is possible to have up to nine data values per card.

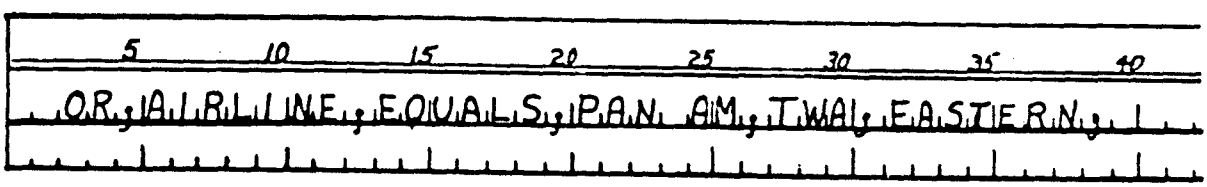


Figure 5-25. Multiple Data Values

This translates to:

```
OR,AIRLINE,EQUALS,PAN AM,
OR,AIRLINE,EQUALS,TWA,
OR,AIRLINE,EQUALS,EASTERN,
```

Either format is correct. Multiple data values are not permitted wi the "OVP" operator.

f. Multiple Field Names.

(1) It is permitted to have a maximum of nine field names card.

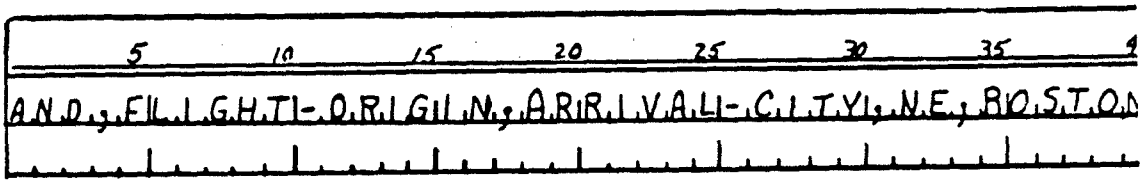


Figure 5-26. Multiple Field Names

This translates to:

```
AND,FLIGHT-ORIGIN,NOT EQU,BOSTON,
AND,ARRIVAL-CITY,NOT EQU,BOSTON,
```

(2) It is illegal to have multiple data values and multiple field names on one line.

(3) The value of the logic connector is the value assigned to each term on the card.

(4) Multiple field names are not permitted with the "OVP" operator.

A cross-indexed data field can appear only once on a logic card.

g. Parenthetical Expressions.

(1) A single level parenthetical expression is allowed. Asterisks are used to denote left and right parens.

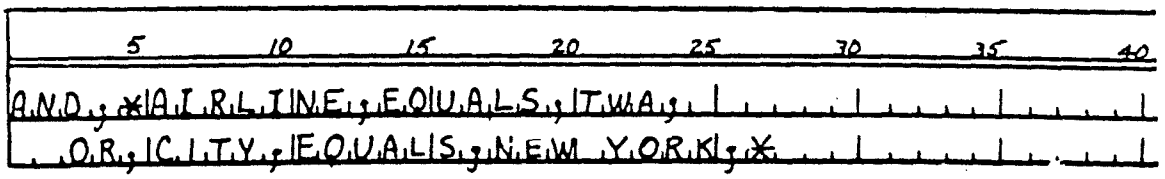


Figure 5-27. Parenthetical Expressions

(2) The second line is indented only to make the format of the sentence clear.

(3) The left paren (*) may appear before or after the adjacent comma, as may the right paren (*).

(4) It is important to note the parenthetical effect on multiple field names or data values.

```
5        10        15        20        25        30        35        40
OR,*AIRLINE,EQUALS,EASTERN,TWA,*
```

Figure 5-28. Parenthetical Expressions - Multiple Data Values

Translates to:

```
OR,(AND,AIRLINE,EQUALS,EASTERN,
    AND,AIRLINE,EQUALS,TWA,      )
```

This is because the logic connector of the first term of a parenthetic expression is an understood "AND" or "IF." The connector preceding the paren (*) is the logic connector which states the relationship of the parenthetical expression to the entire logic of the statement.

NOTE: "AIRLINE" is a periodic field; the above term would be incorrect if it were a fixed field.

h. Period.

(1) The period is used when the INTRA mode logic sequence is to be broken. The period can appear only at the end of a logic statement.

```
5        10        15        20        25        30        35        40
AND,LORIG,EQUALS,ATLANTA,.
```

Figure 5-29. Breaking INTRA Mode

(2) The period must always appear after the comma to avoid confusing it with a decimal point in the data value.

(3) With respect to the right paren (*), which may be adjacent to the period, no distinction is made as to which must appear first.

```
     5         10        15        20        25        30        35        40
N.D.,L.T.E.R.M.,E.Q.U.,M.I.A.M.I.,I*.
```

```
     5         10        15        20        25        30        35        40
A.N.D.,L.T.E.R.M.,E.Q.U.,M.I.A.M.I.,I.*
```

Figure 5-30. Parenthesis and Period

Both of the above have the same value.

i. Polygon Operator. It is illegal to have multiple data values when using the polygon operator (meaning more than one polygon or point)

```
     5         10        15        20        25        30        35        40
I.F.,C.O.O.R.D.,O.V.P.,3.Ø.Ø.Ø.Ø.N.Ø.3.Ø.Ø.Ø.Ø.W.,
```

Figure 5-31. Polygon Operator

A maximum of eight polygon points may be submitted. When no more points can be placed on a card, the points are continued on to the next card. There is no restriction as to the starting location of the points on the second or third level; however, all points must be carried on no more than three lines.

```
     5         10        15        20        25        30        35        40
.I.F.,C.O.O.R.D.,O.V.P.,3.Ø.Ø.Ø.Ø.N.Ø.3.Ø.Ø.Ø.Ø.W.,
 3.1.Ø.Ø.5.Ø.N.Ø.3.Ø.Ø.Ø.Ø.W.,3.1.Ø.3.1.5.N.Ø.3.1.Ø.Ø.Ø.Ø.W.,
```

Figure 5-32. Polygon Operator - Multiple Cards

5-5. SUMMARY OF LOGIC CARDS:

Every entry (field) on the logic card must be terminated with a comma.

A logic statement must begin in any of the first three columns of a card. However, the entire logic statement must be contained on one card, and each logic statement must be initiated with a new card, except polygon operator.

A logic card may have a maximum of nine field names or data values, however, one logic card may not have both.

An asterisk (*) is used in place of left and right parens. The parens (*) have no requirement as to order with respect to adjacent commas.

Logic cards employing the polygon operator may not employ the multiple data value option.

All coordinates are entered in a 15-character format 300000N0300000W.

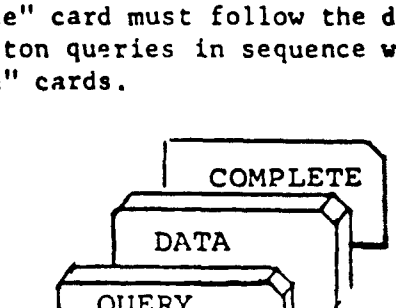
A period is used to interrupt INTRA logic against periodic sets.

When the period is employed, it must appear after the associated comma.

a. Condensed Format Query.

(1) A means of conserving time for the retrieval technician is the condensed format query. The terms in this type query are written in the same manner that any other query terms are written. However, instead of supplying a data value, question marks will be supplied to equal the FFT size of the element supplied in the second part of the query term. This query then becomes known as a skeleton query and may be used many times with different data values supplied each time. Each time new data values are supplied for the elements in the query, the query will be given a different search number.

(2) When the condensed query is run, the data values will be taken from the data card, from left to right, and inserted into the skeleton query starting with the first logic card and continuing until no more "question mark" fields are empty. The data cards must follow the skeleton query. A "skeleton" card must precede the actual query skeleton and a "complete" card must follow the data cards for that skeleton query. Thus, two skeleton queries in sequence would require two "skeleton" cards and two "complete" cards.



Condensed Format Card Order

(a) The skeleton card will have the word "SKELET punched in the first eight columns of the card.

(b) The query card will be like other query card figure 5-14) except that the logic cards will contain question m place of data values.

(c) The data cards will have "DATA" punched in t four columns of the card. A comma follows the word "DATA" and t data values supplied in the card are separated by commas. Data may be specified in columns 6-69 with column 70 being reserved f last data field comma.

(d) The complete card has the word "COMPLETE" pu the first eight columns.

(3) Example of a Condensed Format Report:

```
RET,CARD,54321
REPORTØ,84?1R,OOOO,CA                                                  0
INQUIRING,C FLA,                                                       0
FILE,CMFLA                                                             0
SKELETON                                                               0
QUERY,CONDENSED FORMAT EXAMPLE                                         0
IF,ANAME,EQ,????????,                                                  0
AND,ORGIN,EQ,????????????,                                             0
AND,LORIG,EQ,????????????,                                             0
AND,LTERM,EQ,????????????,                                             0
SORT,ANAME,ACTYP,                                                      0
OVERRIDE,2T,                                                           0
DATA,AMERICAN,NEW YORKØØØØ,PITTSBURGØØØ,
DATA,CHICAGOØØØØØ,EASTERNØ,BOSTONØØØØØØ,NEW YORKØØØØ,
DATA,WASHINGTONØØ,FRONTIER,DENVERØØØØØØ,
DATA,COLORADO SPR,AMARILLOØØØØ,
COMPLETE
END
```

The above example of a condensed format query will produce three q The data values, represented by question marks in the skeleton que be supplied by data for those respective fields from the data card Thus the first query would read:

```
IF,ANAME,EQ,AMERICAN,
AND,ORIGIN,EQ,NEW YORK,
AND,LORIG,EQ,PITTSBURG,
AND,LTERM,EQ,CHICAGO,
```

Multiple data values may be used in any of the fields in the query If this is done, the multiple fields must be filled in the data car the same way they were allowed in the query.

For example, the query card would read:

AND,ACTYP,EQ,????,????,

and the data card for that term of the query would read:

DATA,_____,_____,DC8B,720B,

(4) Query Number Options. The condensed format capabilit allows four options for the query number. These options are: Sequential blank, first data field, and any data field. The option is selected for a given set of condensed format queries by inserting the proper control information into columns 75-78 of the query card belonging to the query skeleton.

(a) Sequential. The above example has used the sequential number option. Columns 75-78 contain XXXX. The X's represent any number from ØØØØ to ØØ99. Each query generated will cause this number to be increased by one, and this number will be the sequenti query number.

(b) Blank. Columns 75-78 blank: All queries of this set will have blank query numbers. NOTE: Blank query numbers would make this field ineffective for cross indexing.

(c) First Data Field. Columns 75-78 ????: The first data field of the data for a given query must be four characters i length. This field will be used as the query number.

(d) Any Data Field. Columns 75-78 XXY¤: The X's represent the data field (01-15) of the data which will be used for the query number. The Y indicates if the first four of the HOP or LOP (high order position or low order position) characters of the data field are to be used. An L in the place of the Y column will cause the four left or HOP characters to be used. Any other character for the Y will cause the four right or LOP characters to be used. The ¤ is a symbol indicat a data field option.

b. Conclusive Logic. One particular variation of the condensed format query allows a defined value to be specified in one of the "AND" terms that must be met. In this case the condensed query will be executed in the conclusive logic "mode." That is, should the record data field, addressed by the "AND" logic statement of the query, not equal the defined value, retrieval will bypass the remaining queries of the query set and execute the next query. Since the defined value of th first query of the query set is common to all the remaining queries in the query set, none of the remaining queries of the set need be executed as they will not be satisfied. Conclusive logic can be executed only wi the condensed query format capability. The following example illustrate the use of conclusive logic:

```
IF,ANAME,EQUAL,????????,
AND,ORIGIN,EQUAL,NEW YORK,
DATA,AMERICAN,CONTINEN,DELTAƀƀƀ,EASTERNƀ,
```

Here New York is a defined value and the recognition of this skeleton will cause the query set (four queries) to be run i: clusive logic "mode." If the data record checked does not m condition of ORIGIN equal New York, then the following three the query set will not be checked. Another use of the concl would be:

```
IF,ANAME,EQUAL,????????,
AND,CAPCY,EQUAL,???,
AND,CAPCY,GRE,100,
DATA,AMERICAN,110,EASTERNƀ,105,
DATA,UNITEDƀƀ,115,TWAƀƀƀƀƀ,125,
```

Here a number of records might be checked against the four qu make up the query set. However, the defined value of 100 wou records of flights with a capacity of less than 100 from bein against any but the first query (IF,ANAME,EQ,AMERICAN,). The value may be in any term in the query provided it <u>must</u> be met record to be retrieved.

5-6. <u>RETRIEVAL SPECIFICATION SHEET</u>:

a. The "Retrieval Specification Sheet" is designed to p analyst with an easy method of communicating his retrieval req to the retrieval technician. The sheet is submitted with the input forms of the reports and requests or can be used to iden standing queries to be run.

b. The sheet specifies:

(1) Priority of items.

(2) Location of the retrieval requirements to be us includes the use of the rerun option on the report and request

(3) The maintenance required for the card requests, mode of input is employed.

(4) Data files required for all reports and requests run.

(5) Special instructions.

(Attach this form to input forms - if any)

RETRIEVAL SPECIFICATION SHEET

Originator _____

Date _____

Department _____

Tel Ex _____

Priority
- ☐ ASAP
- ☐ RUSH

INPUT TYPE:

☐ CARDS:
- ☐ To be Punched.
- ☐ On File (If checked, header forms must follow).
- ☐ Retain Cards On File.
- ☐ Return Cards.
- ☐ Place Cards in Standing Query File.

☐ STANDING QUERY FILE:
- ☐ Query File ID _____
- ☐ Query All Items on Query File
- ☐ Selective Query Identificatio Follows - Report/Request IDs.

___ ___ ___ ___ ___

___ ___ ___ ___ ___

DATA FILES REQUIRED

___ ___ ___ ___ ___

PAPER SPECIFICATION

Paper Size: _____

Number of Copies _____

SPECIAL INSTRUCTIONS

_____

_____

_____

****

****

(This Section filled in by Retrieval Technician)

Query File Identification: _____ (If Query File Created)

All Reports/Requests/Queries That Were In Error Are Noted On The Reverse Side of Form.

Figure 5-33.

SECTION SIX

DATA ARRANGEMENT

Of almost equal importance to selecting data is the combining and of data that has been selected by some logic criteria. The power arrange data is one of the greatest advantages gained through use computer system - and it is, in fact, a surreptitious extension of logic of retrieval. Often, information gains importance by nature relationship to other information. This ability of retrieval will an analyst to do correlation and trend analysis, and it will be th difficult retrieval "tool" for the analyst to use correctly.

6-1. ANSWER TAPE:

a. The answer tape is used to store the retrieved data reco will be used as input to the output system. There are three types records written on the answer tape.

Type 1 Report header records consisting of the report c any comment cards, and the inquiring cards.

Type 2 Request header records consisting of the request any comment cards, and the logic cards.

Type 3 Answer (data) records.

The report and request header records contain the retrieval requir for the run. These are written on the answer tape during one phas the retrieval program. Another phase of the retrieval program ret from the data files all the records that satisfy these requirement places them on the answer tape after the request and report header

b. All of these record types are affixed with a sort key. sort key will contain information which will allow proper ordering the records. The sort key for the type 1 and type 2 records will contain any data. The major sort fields are:

Group ID - This is a report/request ID which is unique t each report or request.

Record Type - This will indicate whether record is type 1 2, or 3.

c. Another phase of retrieval called the retrieval sort prog will then arrange these records on the answer tape using the conter the sort key. They will be grouped by report/request ID which assu that the question and answer records will appear together. Within report/request group they will be grouped by record type which assu that the request or report header record will appear before their respective answer records.

d. The remainder of this section will be concerned with the arrangement of the answer records within the requests or report groups. It will discuss the other fields of the sort key and their uses.

6-2. THE SORT KEY FOR THE DATA RECORDS: Each data record that satisfies a retrieval requirement is affixed with a sort key on answer tape. An understanding of the components of this sort key will enable the analyst to better understand the ordering procedure for data records.

Report/ Request Number (Group ID)	Record Type	Query Number (Search Number)	File Sequence Number	Sort Information From Data Record

Figure 6-1. Sort Key

a. Report/Request Number (Group ID). These two characters serve to identify one report or request from another. The report/request number is assigned by a run compiler and does not affect the order of answers within a report or request, but simply assures that all answers from a given report or request appear together.

b. Record Type. This is a one-character indication of the record type. It is used to place the request or report header records before their respective answer records on the answer tape.

c. Query Number (Search Number). Although this number is present in all answers it has meaning for sorting purposes only when employing a report format that has more than one question (query). Note that this number is in a "high order" position of the sort key, and with respect to ordering answers for a report, is a "major" sort field. When a data record satisfies a query's parameters, the query number assigned to that query is placed in this position of the sort key affixed to the answer record. The use of the query number allows for logical ordering by criteria not in the data file. That is, when the logic of a query is satisfied by the data record, the query number associated with the logic that was satisfied by the data record is assigned to the sort key for that data record.

d. File Sequence Number. The file sequence number is meaningful only when a multifile report format is employed. Probably, the best way to understand the file sequence number is to visualize it as "The order in which the answers from a multifile report will appear on the printed page." More specifically, it specifies the order in which answers from different files will appear in a physical or logical group. The value for the file sequence number is specified on the "inquiring" card. The format of the "inquiring" card is covered in section five. The position designated for the file sequence number in figure 6-1 is the "normal" position. That is, the file sequence number will occupy the position

shown unless some other position is specified by the analyst. T of being able to change the position of this number will be demo in the paragraph titled "Ordering and Data Merge -- Multiple Fil subparagraph 6-7.d of this section.

e. Sort Information from Data Record.

(1) This twenty-five position area will be the most u portion of the sort key, for it provides for the ordering of dat using the information taken from the data record itself.

(2) Following the logic statements to select data rec the analyst may state that he wants values taken from specified in each data record that satisfies the logic and placed in the s for that record. This is done through the use of a sort card. example:

SORT,DEPDT,ANAME,ORGIN,

would specify that if the data record satisfies the logic condit move the value found in the "DEPDT," "ANAME," and "ORGIN" field sort key.

SORT KEY

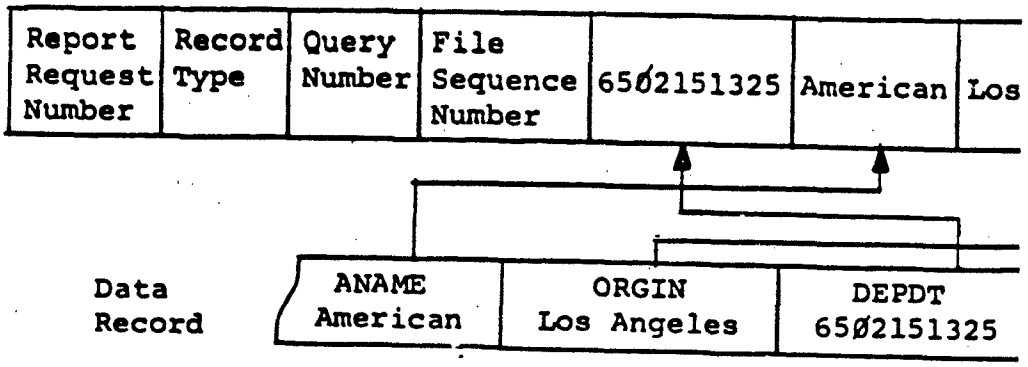


Figure 6-2. Data for Sort Key

(3) This so[illegible] xample would produce a list of records chronological order of date, within dates by airlines, and final within airlines by cities. These fields have a combined total o character positions. As only 25 characters are allowed in the s key, the last 5 positions of the origin field will be truncated.

(4) The detailed format of the sort card will be foun section five.

6-3. COLLATING SEQUENCE: The collating sequence is the normal the character set employed. For the 1410, the collating sequenc common characters is:

BLANK,A,B,C,D.....X,Y,Z,0,1,2.....8,9,

For the complete 1410 character and associated collating sequence, reference "Reference Manual, IBM 1410 Data Processing System." Retrieval will sort information in an ascending sequence.

6-4. FUNCTION OF A SORT KEY:

a. Assume a sort key having two sort fields, termed a "major" and "minor" sort field.

MAJOR	MINOR

NOTE: Graphically, the major sort field will always be shown on the left.

In the following example, note the function of the major and minor sort fields and the effect of the above stated collating sequence on the data.

MAJOR	MINOR
EAST WEST	DC6
EAST WEST	DC7
EASTERN	DC8
EASTERN	VISCOUNT
EASTERN	707
TWA	707
TWA	727

Figure 6-3. Function of the Sort Key

b. In the major sort field, which establishes the "major order," "EAST WEST" appears before "EASTERN" because the fifth character of "EAST WEST" is lower on the collating scale than the fifth character of "EASTERN." Likewise, "EAST WEST" and "EASTERN" both appear before "TWA," because in comparing the first characters, "E" is lower than "T" in the collating sequence.

c. In a like manner, the values in the minor sort field are ordered. Note that within the "EASTERN" entries, "VISCOUNT" appears before "707." This is again because alpha characters are assigned a lesser value than numeric characters in the collating sequence.

6-5. SORTING ON PERIODIC INFORMATION:

a. Retrieval is capable of ordering data records on information carried in the fixed or periodic sets. There is no limit to the number of fixed fields which may be employed as sort fields except the physical

limitations of the sort card. However, if periodic sorting is only one periodic field may be specified on a sort card.

NOTE: One periodic field and one or more fixed fields may appe sort card.

b. The periodic set from which a sort field is selected assigned the scan mode. In the scan mode all subsets which sati the logic condition are flagged with an indicator showing all s which satisfied the logical conditions.

6-6. METHODS OF ARRANGING DATA: Data may be ordered or merged four methods:

a. Order data records retrieved from a single data file b a common data field or fields within the data records.

b. Order data records retrieved from a single data file b a criteria not in the data records.

c. Merge data records retrieved from two to ten data file a common data field or fields in all data records common to all files.

d. Merge data records retrieved from two to ten data file employing a criteria not in the data records.

6-7. MERGING AND ORDERING EXAMPLES: The following examples dem the use of the sort key attached to each data record.

NOTE: The record type field of the sort key will not be include examples. It has no effect on sorting answer records.

a. Ordering - Answers from Single File. For this example request format is used, and the request has been assigned an arb request number of 01 and search number of 0001. The request is against the sample "Commercial Flight File," (section two).

LOGIC: IF,AIRLINE,IS EQUAL TO,AMERICAN,
OR,AIRLINE,IS EQUAL TO,UNITED,EASTERN,

The data records satisfying this logic are desired in order of:

AIRLINE-NAME - FIRST

FLIGHT-ORIGIN - SECOND

This information is carried on the "sort" card in the format (sor format - reference section five):

SORT,AIRLINE,FLIGHT-ORIGIN,

This request is passed against the "Commercial Flight File," and the following lists the answer records with their associate sort key in their final order:

01	0001		AMERICAN	CHICAGO	DATA RECORD
01	0001		AMERICAN	CLEVELAND	DATA RECORD
01	0001		EASTERN	CHICAGO	DATA RECORD
01	0001		EASTERN	MIAMI	DATA RECORD
01	0001		EASTERN	WASHINGTON	DATA RECORD
01	0001		UNITED	DETROIT	DATA RECORD

Sort Information from Data Record

File Sequence Number

Search Number

Request Number

Figure 6-4. Sort Key - Request Example

Note the absence of any information in the file sequence number section. In a request, this information is meaningless. The order of the data records depends entirely on the values in the area of the sort key containing sort information from the data records. In stating the sort to be on first, the "AIRLINE" field, and second on the "FLIGHT-ORIGIN" field, the "AIRLINE" field is automatically designated to be the major sort field, and "FLIGHT-ORIGIN" the minor sort field.

b. Ordering Answers on Periodic Information.

(1) For this example the request format is used. The request is directed against the Commercial Flight File.

IF,FLIGHT-ORIGIN,EQUALS,BALTIMORE,
AND,FINAL-DESTINATION,EQUALS,SAN FRANCISCO,
AND,PASSENGERS-ONBOARD,IS GREATER THAN,100,

The data records satisfying this logic are desired in order of "LEG-ORIGIN" which is a periodic field within periodic set one. This information is carried on the sort card in the format:

SORT,LORIG,

The field "PASSENGERS-ONBOARD" specified in the logic criteria is also a periodic field within periodic set one. Whenever this field within data record is greater than 100 (and the other terms have been sati: the subset satisfying the data field will be flagged.

(2) When all the terms of the search have been satisfied a data record, retrieval will examine each subset of set one to dete if it is flagged. When a flagged subset is located, the data in the ORIGIN field of that subset is moved to the record sort key and the will be written on an answer tape. Retrieval will continue to check subsets for flags and output a new record each time one is found. T multiple output of the same record will occur only if periodic sorti specified.

(3) Assume a data record from Commercial Flight File cont four subsets in periodic set one having the following format:

SUBSET SEQ NO	LORIG	LTERM	LDATE	LTIME	ALTTD	ONBRD	FU
+ 001	BALTIMORE	PITTSBURG	15	0800	330	105	2
002	PITTSBURG	CHICAGO	15	0900	350	98	2
+ 003	CHICAGO	OMAHA	15	1000	320	101	2
+ 004	OMAHA	DENVER	15	1015	330	103	2

Subsets 001, 003, and 004 have satisfied the logic condition (GREATE THAN 100 - FOR PASSENGERS-ONBOARD) and have been flagged (with a + s over the second character of the subset sequence number). The recor will be written on a answer tape three times. The sort keys of each the respective records will contain Baltimore, Chicago, and Omaha in leg origin field.

NOTE: When a periodic field is employed in a search (request/query) sort parameter, at least one logic term against some field (possibly same field used for sorting, but not necessarily) in the same period: set as the sort field must be included in the search. Further, this must be employed so that it must be satisfied before the searc... is satisfied. For example (CMFLA file):

A. IF,AIRLINE.EQUALS,UNITED, (Fixed)

B. AND,LEG-ORIGIN,EQUALS,CHICAGO, (Periodic Set 1)

C. SORT,LEG-TERMINATION, (Periodic Set 1)

The above search with periodic sorting is acceptable since term B must be satisfied if the entire search is to be satisfied. The following search is not acceptable since term B need not be satisfied. Therefore, a record may satisfy term A, and term B will not be processed; no subsets will be flagged negating the possibility of periodic sorting.

A. [illegible],AIRLINE,EQUALS,UNITED,

B. OR,LEG-ORIGIN,EQUALS,CHICAGO,

C. SORT,LEG-TERMINATION,

c. Ordering and Logical Merge - Multiple Files. In this example, the report format is used; four questions are being directed against two data files.

REPORT NUMBER: 02

(1) Requirement. Collocate under the entries for New York and Chicago from the "Airport File," all airlines that fly into either city from Denver. (These entries are from the "Commercial Flight File.")

(2) Desired Order. The list of airlines is desired in order of the final destination, and within final destination, by order of airlines. The order in which the records are desired on the printed page (file sequence number) is the "Airport File" record first, followed by all of the records which satisfy the logic condition from the "Commercial Flight File." The technique used to construct this multifile report is by use of the query number as the major sort field. The retrieval cards for Report 02 will appear as follows:

NOTE: The cards have been sorted by operator to group the cards by the files that are being retrieved against.

	File Numeric	Report #	Query #	Card Seq #
REPORTØ,	00	02		01
INQUIRING,AIRØA,CMFLA,	00	02		02
FILE,AIRØA	01			
QUERY,	11	02	0001	01
IF,CITY,EQUALS,CHICAGO,	11	02	0001	02
QUERY,	11	02	0003	01
IF,CITY,EQUALS,NEW YORK,	11	02	0003	02
FILE,CMFLA,	17			

	File Numeric	Report #	Query #
QUERY,	17	02	0002
IF,FLIGHT-ORIGIN,EQUALS,DENVER,	17	02	0002
AND,FINAL-DESTINATION,EQUALS,CHICAGO,	17	02	0002
SORT,FINAL-DESTINATION,AIRLINE,	17	02	0002
QUERY,	17	02	0004
IF,FLIGHT-ORIGIN,EQUALS,DENVER,	17	02	0004
AND,FINAL-DESTINATION,EQUALS,NEW YORK,	17	02	0004

Figure 6-5. Cards for Logical Merge

This report is passed against both the "Commercial Flight File" "Airport File." The following lists the sort keys of the result answers in their final sorted order:

02	0001	01			DATA
02	0002	02	CHICAGO	AMERICAN	DATA
02	0002	02	CHICAGO	AMERICAN	DATA
02	0002	02	CHICAGO	CENTRAL	DATA
02	0002	02	CHICAGO	UNITED	DATA

ETC.

02	0003	01			DATA
02	0004	02	NEW YORK	AMERICAN	DATA
02	0004	02	NEW YORK	UNITED	DATA

Sort Information from Data

File Sequence number

Query Number

Report Number

Figure 6-6. Sort Example - Logical Merge

In this example, note the importance of the query number and the file sequence number. The query number assembles the answers from the two data files in the specified groups, and the file sequence number assigns the order of the files within the groups. There are a total of five distinct sort fields required to assemble this report. The "1" in the file sequence number indicates the data record is from the "Airport File," and the "2" indicates the data record is from the "Commercial Flight File." These values were assigned by the inquiring card.

d. Ordering and Data Merge - Multiple Files. In this example, the same end result is desired as the previous example; however, a simpler technique will be employed - using the option to relocate the file sequence number.

(1) Both data files under consideration have between them a "common handle" or a common piece of information that allows the merging of the two files on that information. This common information in the Airport File is the "CITY" in which the terminal is located, and in the Commercial Flight File is the "FINAL DESTINATION."* Both fields have the same format and are the same length.

(2) The same order is desired for the files on the printed page, so the inquiring card format will be identical to the previous example. However, the grouping is no longer dependent on the query number, and only one query against each file is required.

(3) The retrieval cards will appear as follows:

	File Numeric	Report #	Query #	Card Seq #
REPORTØ	00	03		01
INQUIRING,AIRØA,CMFLA,	00	03		02
FILE,AIRØA	11			
QUERY,	11	03	0001	01
IF,CITY,EQUALS,CHICAGO,	11	03	0001	02
OR,CITY,EQUALS,NEW YORK,	11	03	0001	03
SORT,CITY,AIRØA,	11	03	0001	04
FILE,CMFLA,	17			
QUERY,	17	03	0002	01
IF,FLIGHT-ORIGIN,EQUALS,DENVER,	17	03	0002	02
AND,FINAL-DESTINATION,EQU,CHICAGO,	17	03	0002	03
OR,FINAL-DESTINATION,EQUALS,NEW YORK,	17	03	0002	04
SORT,FINAL-DESTINATION,CMFLA,AIRLINE,	17	03	0002	05

Figure 6-7. Cards for Data Merge

(4) Since the two files are being merged on data within files, the merge must be specified on a sort card for each file. A indicator on the sort card must also be present to indicate to retr to shift the file sequence number in order to make the merge data f data files the major sort field.

(5) For the AIRPORT FILE QUERY, the sort card appears as

SORT,CITY,AIRØA,

NOTE: AIRØA is the five-character mnemonic name of the Airport Fil

(6) Using the file mnemonic in the sort card effects the shift of the file sequence number (the value specified by the file relative position on the inquiring card) to the first position in t key following the "CITY" data.

(7) For the Commercial Flight File query the sort card w have the following format:

SORT,FINAL-DESTINATION,CMFLA,FLIGHT-ORIGIN,

NOTE: "CMFLA" is the five-character mnemonic name of the Commercia File.

(8) Again, the use of the file mnemonic effects the shif the file sequence number to the first position after the value for DESTINATION in the sort key.

(9) After passing both queries of this report against th required data files, the order and format of the resulting answer re sort keys are shown on figure 6-8.

(10) It is important to note several items in these sort

(a) The query (search) number is set to zero so tha does not affect the sort.

(b) The normal position of the file sequence number does not carry any meaningful information.

(c) The file sequence number has been moved to the specified for the file from the inquiring card.

(d) If the 25 characters allowed in the section of sort key for sort information from the data record is exceeded, the data field in the sort key will be automatically truncated.

03	0000	0	CHICAGO	1		DATA RECORD
03	0000	0	CHICAGO	2	AMERICAN	DATA RECORD
03	0000	0	CHICAGO	2	CENTRAL	DATA RECORD
03	0000	0	CHICAGO	2	TWA	DATA RECORD
03	0000	0	CHICAGO	2	UNITED	DATA RECORD

ETC.

03	0000	0	NEW YORK	1		DATA RECORD
03	0000	0	NEW YORK	2	EASTERN	DATA RECORD
03	0000	0	NEW YORK	2	UNITED	DATA RECORD

NOTE: Relocated File Sequence Number

Sort Information from Data Record

File Sequence Number (Normal Position)

Query Number (Set to Zero)

Report Number

Figure 6-8. Sort Example - Data Merge

(11) It is interesting to compare the sort keys for tl previous examples.

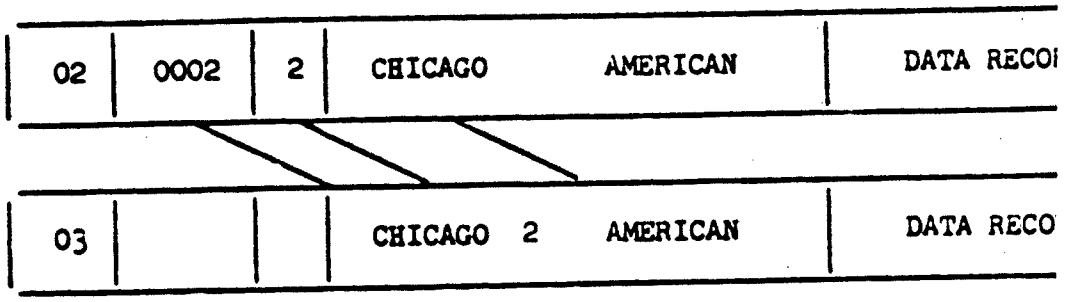


Figure 6-9. Sort Key Comparison

The query number and file sequence number for the Report 03 sort been omitted, in that it was noted these items did not contribute order of Report 03. Note the shift in the major sort field. Rep employs the query number to assemble the report, and Report 03 em information from the data record.

(12) The advantages of a multifile merge using data in to accomplish the merge would have been better demonstrated had t two or three hundred airports in this report.

(13) In using file data to merge data files, it is most to ASCERTAIN THAT THE COMMON INFORMATION BEING EMPLOYED FOR MERGE

of the same format

of the same length

e. Periodic Presort. In addition to the sorting described request or query form, the 1410 FFS has a periodic presort capabi

(1) Periodic presort is capable of ordering data recor information carried in the fixed or periodic sets. There is no l on the number of fixed or periodic fields which may be employed a fields except the physical limitations of the sort card (25 chara However, if periodic sorting is utilized, fields from only one pe set may be specified on the sort card.

(2) Periodic sorting may be accomplished using the ent record retrieved, or it may use only the periodic subsets that me specified conditions (if retrieval was run in the scan mode on th periodic set). A distinction must be made by specifying "SORT" o FLAGGED" at the end of the sorting instructions.

Example:

1. SORT,LORIG,LTERM,
2. SORT,FLAGGED,LORIG,LTERM,

The first example would sort all subsets (for that periodic set) of the data records retrieved. The second example would sort only the flagged subsets and it would require that the retrieval run be operated in scan mode on that periodic set. (See pages 5-2, 5-12, and 5-13 for sort cards.)

(3) In order to use periodic presort, it will be necessary to take the file tape or retrieval answer tape and rerun with specified control cards. The following examples describe the three types of presort runs that are permissible.

1. To sort a file:

```
        1         9
Card 1 REQUEST,8421R
Card 2 FILE1,CMFLA
Card 3 SORT,LORIG,LTERM,_________,
Card 4 END
```

2. To sort a retrieval request:

```
Card 1 FILE1,CMFLA
Card 2 SORT,LORIG,LTERM,______,
Card 3 END
```

3. To sort a multifile retrieval report:

```
Card 1 FILE1,CMFLA
Card 2 SORT,LORIG,LTERM,______,
Card 3 FILE2,AIRØA
Card 4 SORT,APORT,RNWYL,ALINE
Card 5 FILE3,LOCØA
Card 6 SORT,CITYØ,LOCØA,______,
Card 7 END
```

(4) It should be noted that only the card "REQUEST,8421R" distinguishes example 1 from example 2. Since this is a file run, the request card with the RITID is used to simulate the request card in the retrieval run. This is necessary to cause it to be treated as a retrieval answer tape.

(5) Example 3 shows how a report with queries directed against multiple files would be run. It is assumed here that LORIG,APORT and CITYØ are fields that have the same description.

(6) Sorting that is specified on the request or query form takes place during the retrieval run if the operator so specifies. However, periodic presort is run on the completed retrieval answer tape. A MON$$ ASSIGN deck and MON$$ EXEQ PS card must be supplied with the control cards listed above when the presort run is made. (See figures 6-10, 6-11, and 6-12.)

SAMPLE PERIODIC PRE-SORT RUN

```
Col. #  6       16      21
        MON$$   JOB     PS
        MON$$   ASGN    MRA,B5
        MON$$   ASGN    MRB,B3,B4,B8  **
        MON$$   ASGN    MRC,A1,A2,A6  **
        MON$$   ASGN    MRD,A3,A4,A7  **
        MON$$   ASGN    MRE,B1,B2,B9  **
        MON$$   ASGN    MRF,B7
        MON$$   ASGN    MRG,A5
        MON$$   ASGN    MWA,FA
        MON$$   ASGN    MWB,FB *
        MON$$   ASGN    MWC,FC *
        MON$$   ASGN    MWD,FD
        MON$$   ASGN    MWE,FE *
        MON$$   ASGN    MWF,FF *
        MON$$   ASGN    MWG,FG *
        MON$$   ASGN    MWH,FH
        MON$$   ASGN    MWJ,FJ *
        MON$$   ASGN    MWK,FK *
        MON$$   ASGN    LIB,
        MON$$   EXEQ    PS

Col. #  1       9
        REQUEST,KITXX,etc

        1       7
        FILE1 CHFLA

        1       6
        SORT,LORIG,LTERM,etc

        1
        END

    Col. # 6       16      21
           MON$$   EXEQ    RT

Col. #  1
        RET,SORT,XXXXX,

    Col. # 6       16
           MON$$   END
```

standard FFS

FFS disk lib

calls in peri

sorts a file
fields LORIG

terminates ru

* These areas need not be assigned if cross index is not used.

** Needed if 3-way merge is going to be used.

Figure 6-10

SAMPLE DECK SET-UP

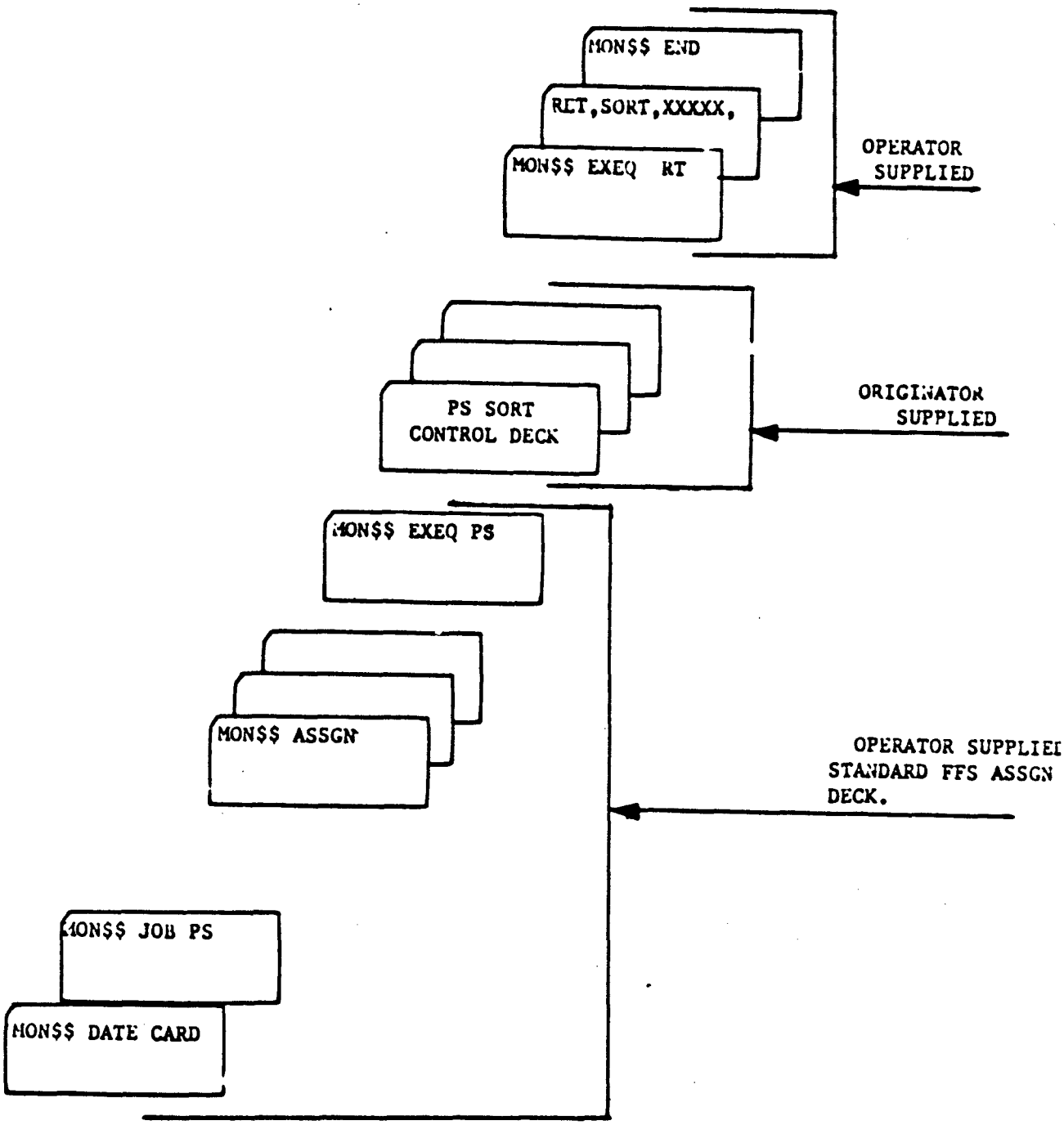


Figure 6-11

INPUT-OUTPUT DATA FLOW

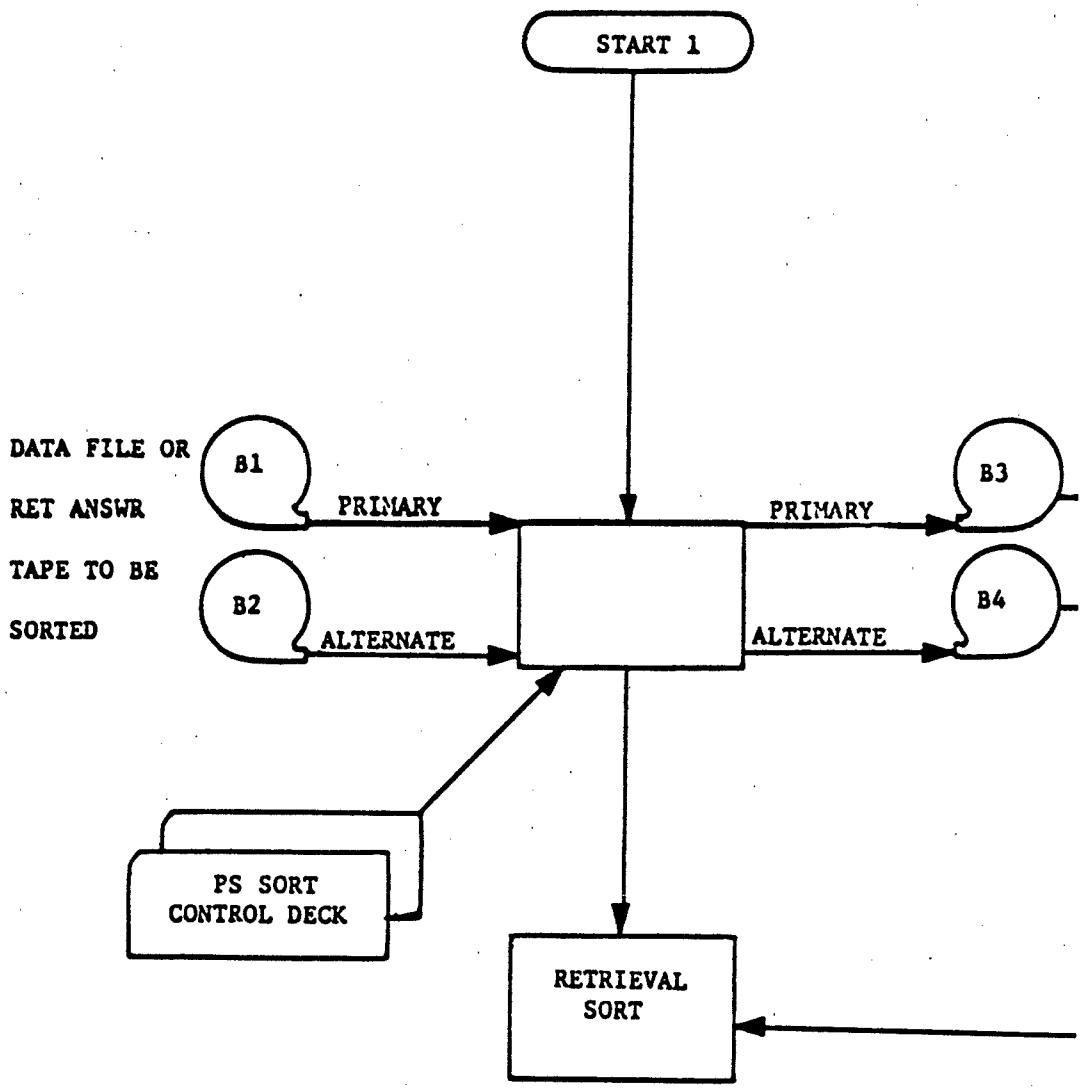


Figure 6-12

6-8. REVIEW - DATA ARRANGEMENT: The preceding examples represent ti ordering techniques of retrieval. These techniques may seem complex, and indeed they are. However, when properly used they will provide the analyst a variety of capabilities not feasible before the introduction of the FFS.

a. The following information should be retained from this section:

(1) The retrieved data records are affixed with a sort key.

(2) The data portion of the sort key is specified by the analyst.

(3) The information contained in the sort key is:

(a) REPORT/REQUEST Number (GROUP ID)

(b) Record Type

(c) Query Number (SEARCH NUMBER)

(d) File Sequence Number

(e) Sort Information from Data Record

b. When no sort information is supplied from the data record, the retrieved data records will appear in their natural file order by query number.

c. Retrieval always provides sorted data in ascending sequence.

d. Only fixed set or periodic set information may be placed in the sort key area designated by "Sort Information from Data Records."

e. A maximum of 25 characters are allowed in the section of the sort key containing the information data record (see subparagraph 6-2.e, "Sort Information from Data Records").

f. Only one periodic field may be placed on the sort card of a request or query.

g. When 25 characters are exceeded, the last field which partially fits into the area is truncated to the correct size.

h. Fields from only one periodic [illegible] may be placed on a sort card for a periodic presort run.

i. When a query is satisfied by a data record, the query number from the query is moved to the "Query Number Area" of the sort key.

j. The value of the file sequence number is taken from the inquiring card.

k. The relative position of the file sequence number may be changed by the analyst to facilitate a multifile merge.

l. The answer tape contains the retrieved records before and after sorting.

SECTION SEVEN

INTRODUCTION TO OUTPUT SYSTEM

7-1. GENERAL: The output system provides the user with print
punched cards, and magnetic tape. The program is so construct
user may specify the format in which the information is to be
and may indicate the source of the information. The sources o
will be the results of retrieval runs, file maintenance transa
confirmation tapes, offline tape, or data directly from the fi
most common source will be the results of retrieval runs (answ
and the normal display will be a printed format. Any of the s
however, or any of the forms of outputs may be selected for a

7-2. OUTPUT PROCESSOR PROGRAM: The output processor is desig
produce the desired output for the user. It is composed of th
phases:

Output Supervisor Phase

Report Structuring Phase

Output Execution Phase

Worktape Output Phase

a. Output Supervisor Phase. Output supervisor schedule
execution of the other phases based on control cards entered a
time. The supervisor handles all communication between the 14
Operating System and the functional programs (figure 1-1).

b. Report Structuring Phase.

(1) The report structuring program forms report ins
tables (RIT) utilizing report specification cards and file for
(FFT). The RIT is a 1410 program which contains many linkages
Output Execution program and which serves to format a report.

(2) Figure 7-1 shows the report structuring phase,
inputs to and outputs from the program. The specification car
checked for errors and to determine if a valid report is struc
RIT is punched into cards and written on a tape. The tape may
update the library if the RIT is to be retained or may be used
to produce a special report.

(3) The report specification cards will be discusse
in this manual. The generation of these cards is the user's re
A good understanding of the techniques of formatting reports wi
puts a very useful tool. The following types of cards are use

(a) Formatting specifications showing the posit
or constants in a print line, card, or tape record.

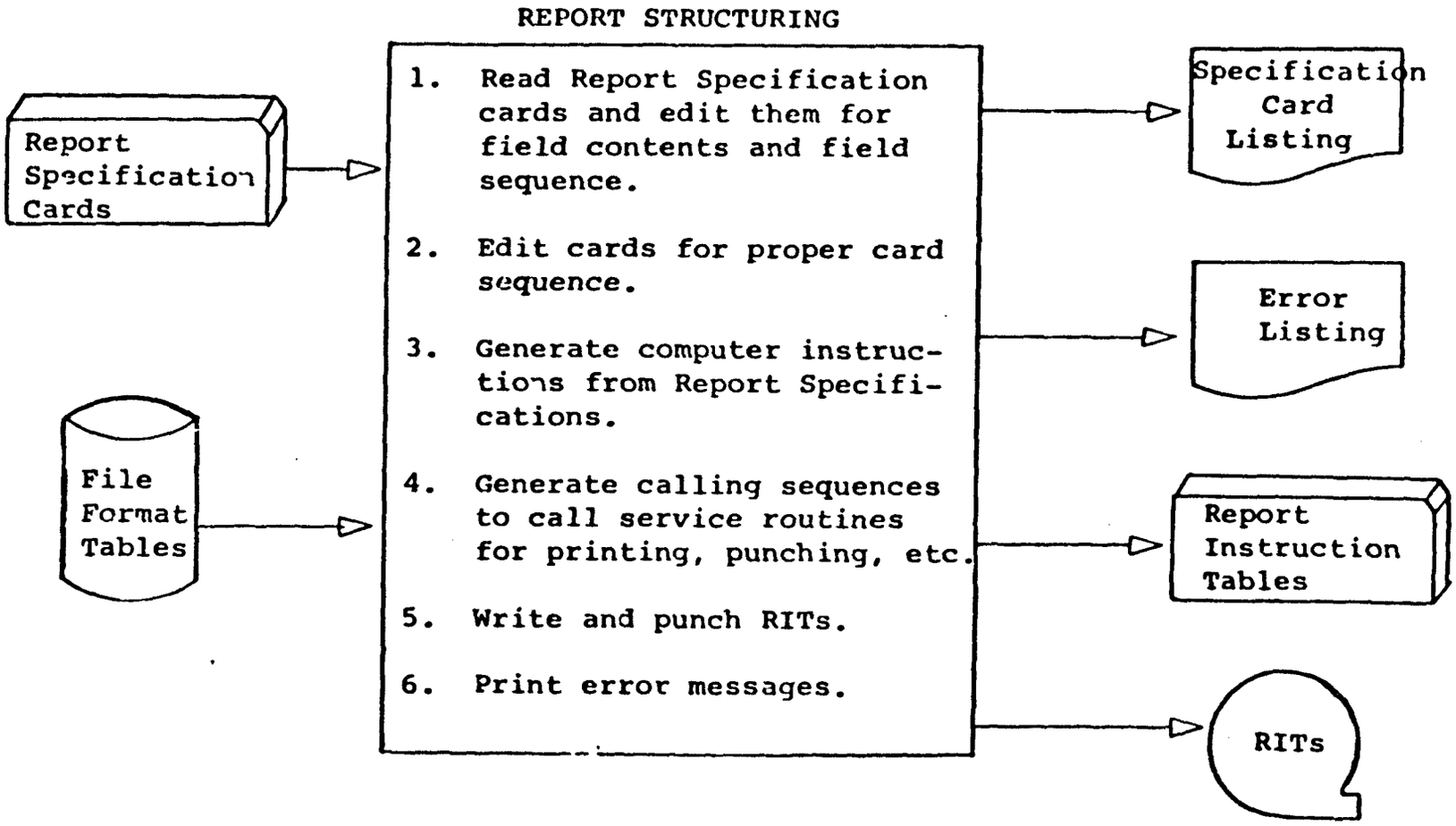


Figure 7-1. Report Structuring

(b) Control information specifying conditional:

Inclusion of input records.
Inclusion of output lines.
Inclusion of fields.
Performance of data manipulation.

(c) Data manipulation information specifying co totals, and counts within a record or between records.

(d) Printed report page specifications includin and conditional spacing, skipping and ejection to a new page.

c. Output Execution Phase. The output execution program reports on paper, punched cards, or magnetic tape. Figure 7-2 s output execution, indicating inputs and outputs. The inputs co a data source and the RITs. The output will be a report genera the data source and formatted according to the RIT.

d. Output Worktape Phase. The output worktape program pr cards and/or listings from an offline worktape generated by outp execution. Figure 7-2 also shows the input and outputs of this Cards and listings may both be output in the same run and may be intermixed on the offline worktape. Printer spacing and skippin performed based on a control character in the print line record. for cards will be 80 characters and for print lines 133 characte four character record character count precedes and a record mark the data on the offline tape.

7-3. FORMATS FOR INFORMATION OUTPUT:

a. There are a variety of formats that can be specified f one output report. Figures 7-3, 7-4, and 7-5 portry the general of a page. card, and a magnetic tape record and the variety of w external data (data not in the input record) can be inserted. I is the insertion of labels which provide identification and clas information; the insertion of literals which provides a label fo particular data element (or as a means of editing); and the auto insertion of page numbers.

b. The data may be presented in many formats according to needs. Figure 7-6 portrays three examples of how data might be p in a printed report. It may be displayed in vertical or horizont or a combination of both. The actual selection of what informati to present, or in what sequence or position they appear, is compl flexible.

7-4. ALTERATION OF INFORMATION:

a. The following options are available for handling the da literals for any report format:

(1) The information can be printed, punched, or writte as it appears in the file.

(2) The data can be edited coincedent with output presentation. The standard editing feature of the system allows the insertion of most system characters, as a prefix, suffix, or between the data characters of the field.

(3) The information can be converted at the time of data output to a different data term. This is particularly applicable to coded data and allows the user to see the information in his own language.

(4) Special subroutine features of the system provide for the ability to alter the data itself.

b. These options are available for any fields or groups. In some circumstances these same options are available for results of computations, literals, and the results of other data manipulation. The options which can be used are discussed under the sections dealing with that particular capability.

7-5. MULTIPLE FORMATS FOR A FILE: All of the above considerations of information presentation have been stated in the context of a single output format. The system allows for as many output formats as are needed to fulfill the user's requirements for any particular file. The specifications can be written, punched, and entered into the system and subsequently called for by "report name" (RITID) as needed; or they can be prepared for a special requirement and used immediately. This is also applicable when information from more than one data file is combined through the mechanism of the retrieval program and presented to the output program for display.

7-6. EXTRACT MODE: In many instances the only requirement that is made by a user is that the data be printed with not too much concern for a final formatted report. The option is provided to have the system design a report format based on the specification of the fields to be put out and in what order; or the entire file may be displayed with a minimum of specifications. This option is called the extract mode (see section eleven) and can produce only a printed output.

7-8. REVIEW - INTRODUCTION TO OUTPUTS:

a. The output system provides the user with three types of outputs; printed listings, punched cards, and magnetic tapes.

b. The report structuring provides a RIT for formatting reports.

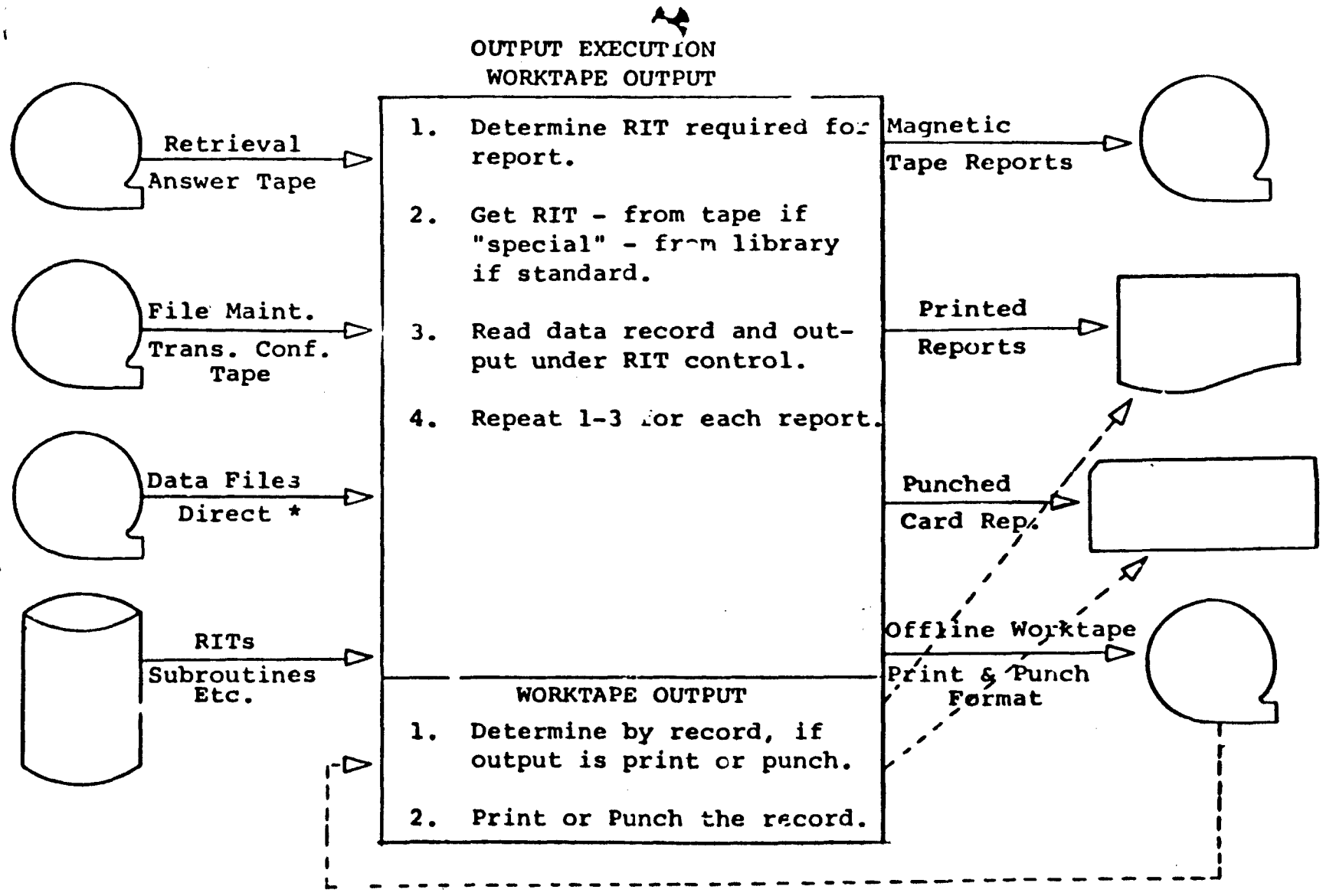
c. The output execution program produces reports according to RIT.

d. Worktape output program produces cards and/or listings from an offline worktape generated by output execution.

e. Printed data may be arranged in vertical columns or horizontal or a combination of both.

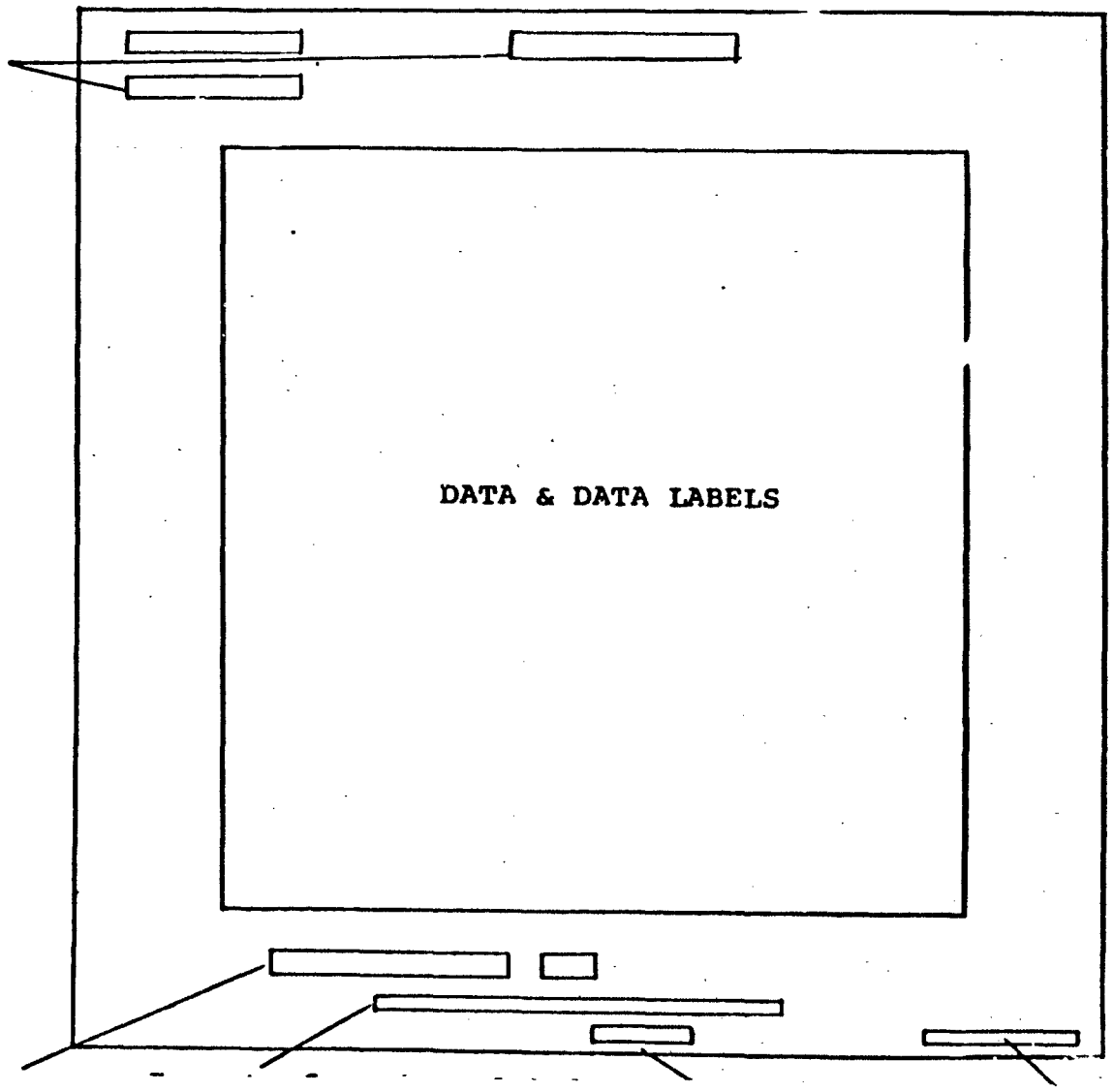
f. Data from files may be altered by subroutines, editing, and manipulations.

g. The extract mode produces machine formatted printed output.



* File Revision Error tapes may be run using the same control cards as used in File Direct.

Figure 7-2. Output Execution-Worktape Output



Insertion of report
Header labels & other
Identification or
Classifying information

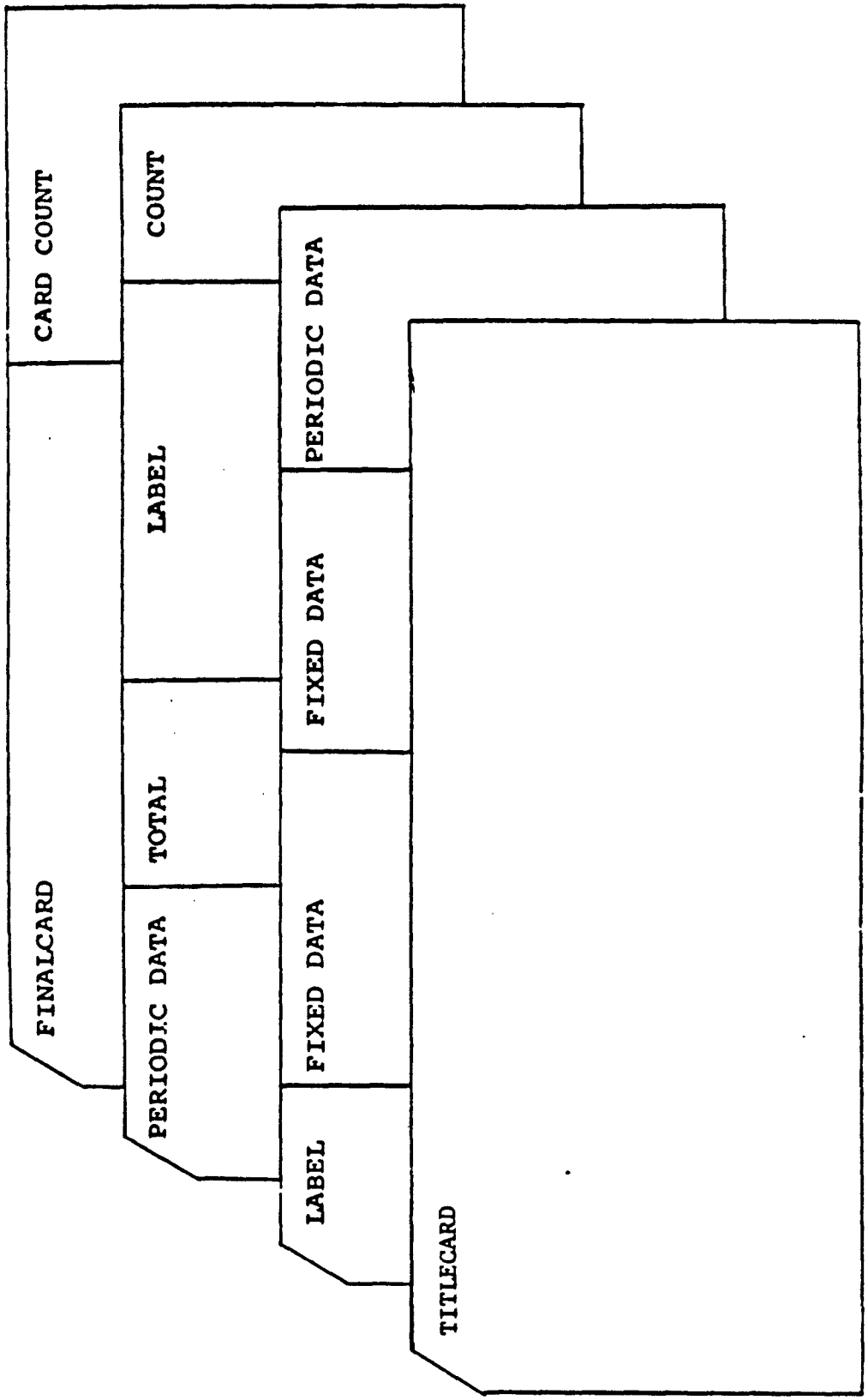


Figure 7-4. Example of Punched Output

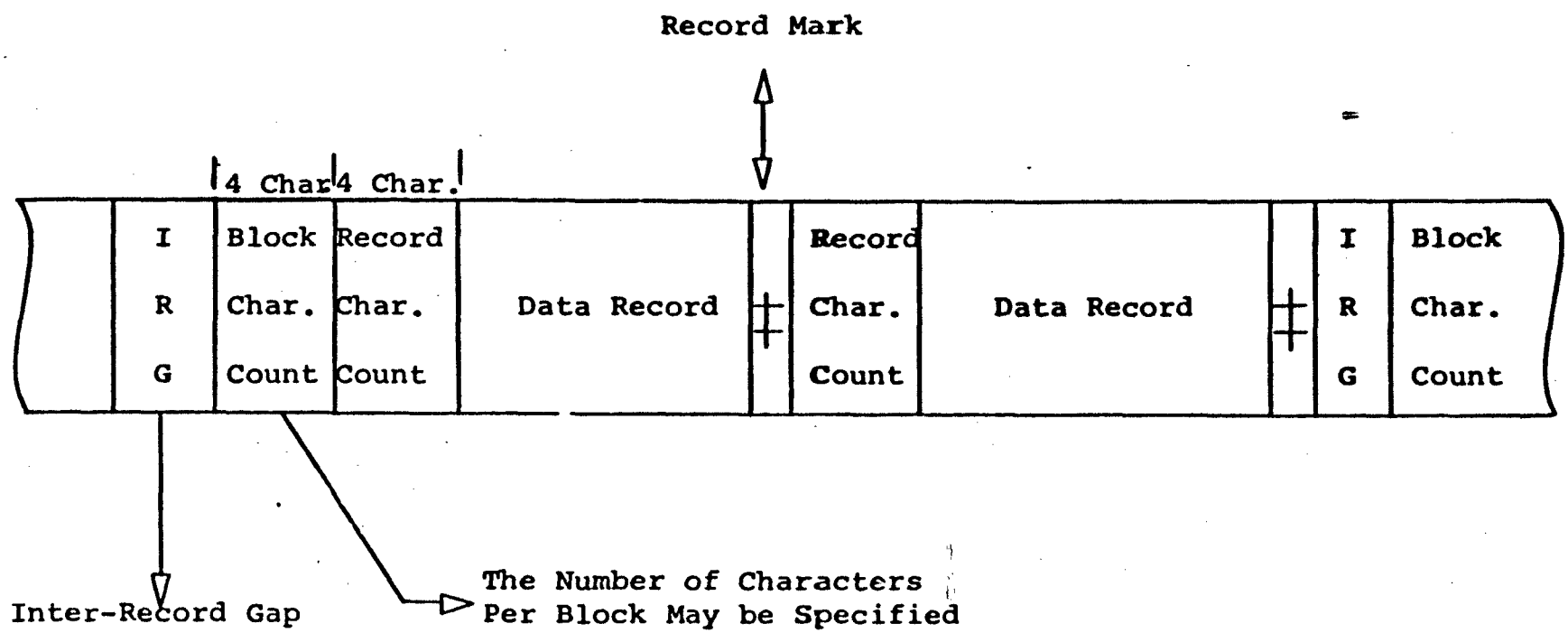
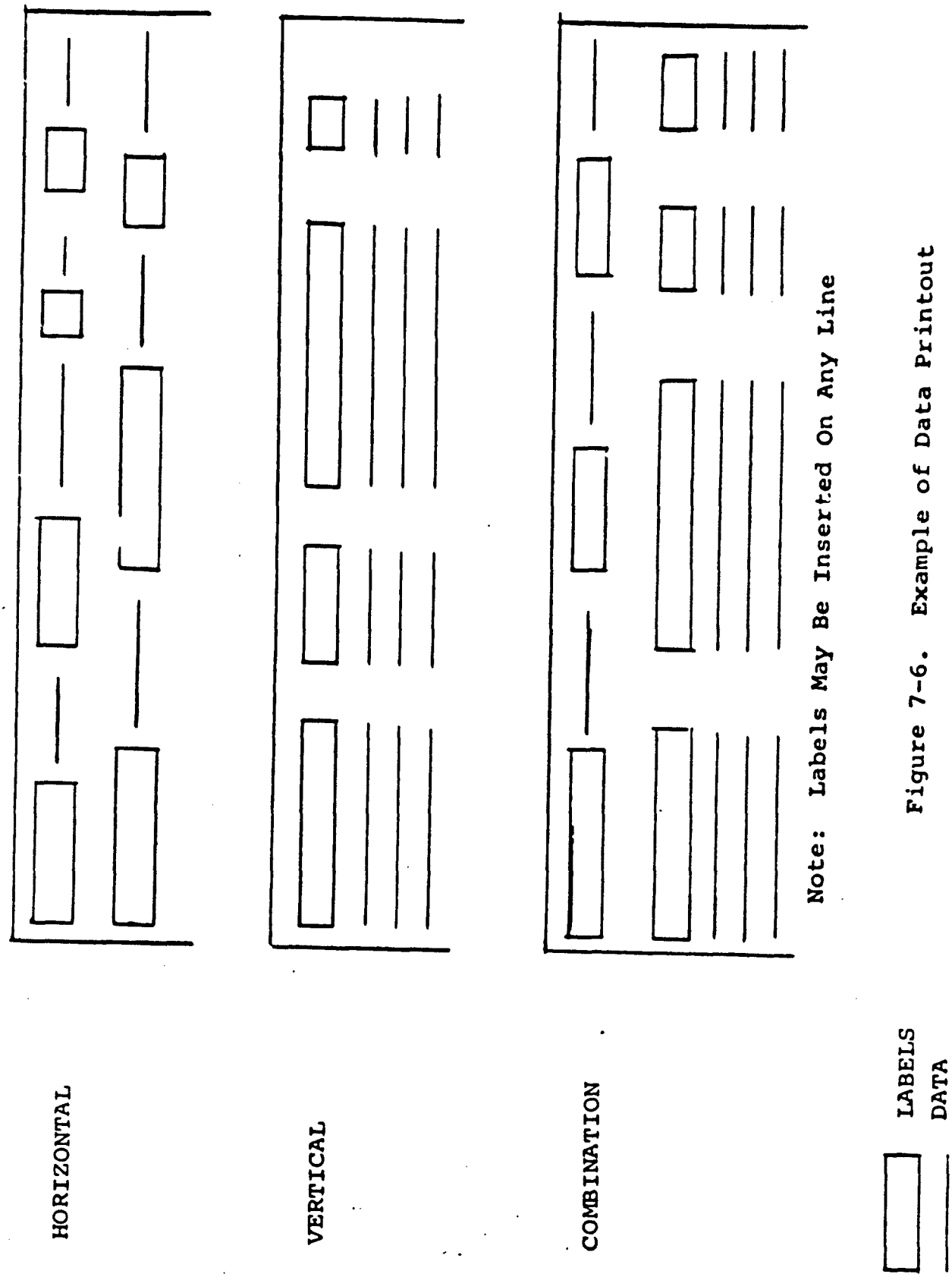


Figure 7-5. Example of Tape Output



Note: Labels May Be Inserted On Any Line

Figure 7-6. Example of Data Printout

SECTION EIGHT

DEVELOPMENT OF A REPORT INSTRUCTION TABLE

This section will discuss in detail the report specifications n generate a normal report format. Section nine will cover the m report specifications. The discussion of the report specificati section will introduce examples to illustrate the specifications these examples are taken from sample problem 1 found in appendi examples will be introduced to illustrate particular specificati Problem 1 in appendix G demonstrates a typical layout of a print the specifications necessary to produce the printed report.

Specifications for punch card and magnetic tape format will appe section nine.

8-1. SPECIFICATION OF THE DATA FILE: The example used here is file report and the first specification should be the file mnemo which the report pertains. This is true whether more than one f is to be specified or if the report is to be just printed as in example. Multifile reports must have the file mnemonic specifie each set of specifications dealing with that file (see appendix a complete discussion of card sequencing and multifile reports).

Thus, for this example the file mnemonic would be specified as:

FILE AIRØA

As with the rest of the FFS, the file mnemonic is five character with an "A". An RIT with more than 22,700 characters can be str but it may not run under a system with less storage, a larger mo a larger Output Execution program.

8-2. FORMATTED REPORTS: The output system can provide formatte either printed on all sizes of paper or reproducing plates, punc or written on magnetic tape. To indicate the type of output des to specify the exact format, report specification cards are used.

8-3. REPORT INSTRUCTION TABLE (RIT): Report specification cards input to the report structuring program of the output processor. cards are analyzed and the specifications are built into a report tion table (RIT) and any errors are printed for review by the us errors are minor enough in nature to allow the compilation of the be completed while others will cause the run to be terminated bef execution phase (if the report is a special) or before the librar phase if it is a standard RIT. In some instances assumptions wil made which will allow the RIT to be structured; however, in any e the errors and/or assumptions are listed.

The size of the RIT may not exceed 22,700 characters if subroutin not used. If subroutines are used, the size of the largest subro be subtracted from the 22,700 to determine the maximum size of th

8-4. ERROR LISTING: A complete listing of error messages can be found in appendix D. This listing includes a cross reference of the error messages with the discussion in the text where the proper procedures can be found.

8-5. REPORT SPECIFICATION CARDS - GENERAL:

a. Output media are indicated on format cards along with specification for overall format control. The five-character file mnemonic to which the specifications pertain is indicated on the file card.

b. Under normal conditions the next item for consideration is the layout of the lines, cards, or tape records, the specification of the positions of the data and any data manipulation or other output requirements. Therefore, any header label lines are defined (header card) followed by the data to go on each line, card, or tape record (line, card, or record cards, respectively). Such operations as edits, conversion tables, output subroutines, calculations, or logical output requirements are also specified on these cards. Label lines, which are either independent or dependent upon the output of data lines, may be specified on label cards. Finally, the trailer lines are defined (trailer card).

c. The normal spacing between lines can be indicated on the format card; however, any other spacing desired can be indicated by space cards. The format of the report can also be controlled with the carriage control tape by the use of the skip card, and an ejection to a new page by the eject card.

d. The above card types are discussed in detail in the following sections along with a discussion of more complex reports and additional specifications necessary to handle these situations.

8-6. CARD LAYOUT:

a. All specification cards, except where noted, are in free format with the card type as the first entry on the card (see appendix E for a complete listing of card types). The succeeding entries on each card are separated by one or more blanks and/or commas. (Blanks and commas may also be used to increase the legibility of the card.) The entries may be placed through column 71 of the card and in certain cases it is necessary to continue the entries on the next card. If this is required each card which has specifications continuing onto a following card must have a "C" in column 72 and the card type as the first entry; otherwise, this column must be blank (limit of 3 cards). If more than three cards are required, the 4th card will be processed as a new card.

b. Columns 73-80 are provided for identification and card sequencing. It is recommended that columns 73-76 be used for deck identification; this identification could be the report instruction table (RIT) identification minus the terminating "R". Columns 77-80 are for the card sequence number. A sequence check is performed on this number; however, any errors detected will not affect the analysis of the cards. If the sequence number is blank or if a sequence error is found, the output program will insert a sequence number ending with "S" and all further references to the card will be with this number.

c. All output positions specified for data fields or litc be low order (rightmost) positions.

d. Comment cards (indicated by an asterisk in column 1) m inserted anywhere in the deck. A summary of report specificatio be found in appendix F.

8-7. CONTROL OF THE GENERAL PAGE FORMAT: The format of a page through the use of a format card. For a printed format the card contain the word "PRINT" following the word "FORMAT."

FORMAT, PRINT

a. Body Lines. The number of lines per page exclusive of and trailer lines. After determining the page layout with the h and trailer lines and their associated spacing, the number of bo desired per page (the number of lines, including spacing, betwee last header line and the first trailer line) may be specified. indicated by including the term "LINES" on the format card follo the number of body lines required.

FORMAT, PRINT, LINES, 55

The above example specifies 55 body lines for the Airport report the "LINES" entry is omitted, the standard mode of 50 body lines be assumed.

b. Normal Spacing Between Lines.

(1) The option is provided to specify an overall spac between lines for the report. The maximum spacing that can be s by this means is 4 spaces. The spacing indicated will be used b output program unless a space card is used to override this spac (The space card will be discussed later in this section.)

(2) The spacing factor is indicated by including the SPACE on the format card followed by the number of spaces requir

FORMAT PRINT, SPACE, 2

The above example specifies double spacing and becomes the norma If this entry is omitted, single spacing will be assumed.

c. Paper Width.

(1) This option is included to provide maximum error for the print output positions specified. The paper size is spe by including the term "SIZE" on the format card followed by the print positions for the width of the paper used for the report.

FORMAT, PRINT, SIZE, 105

The above example specifies the width of the report to be 105 print positions. If this entry is omitted, the standard 132 position paper will be assumed.

(2) The above specifications can be entered on the format card in any order after the word "PRINT." For example:

ed
ys

FORMAT, PRINT SPACE, 2, SIZE, 105, LINES, 55

The above example combines all three options.

NOTE: The entries for punched card and magnetic tape reports are discussed in the sections dealing with those media.

8-8. HEADER LINES: Header lines are specified following the format card. These are nondata lines printed at the top of each page. Header lines will normally contain system labels and other descriptive information concerning the report.

a. Specification of System Labels at Execution Time. The output system provides the ability to specify certain parameters when the report is produced. These are specified through the use of system labels at the time the RIT is compiled and with their respective output control cards at execution time. The system labels are discussed more fully in sections dealing with specifications where they might logically be used. It is sufficient to define them at this point.

b. OPDATE. This item is used to indicate that a specified date is to be used for this report. It is an eleven-character field that can be entered on a date card at the time that a report is produced. The output program will utilize the date as specified on the control card. If the date card is omitted at execution time, the output program will use the system date.

c. PAGENO. This term is used to specify page numbering and is a six-digit field which may be specified at execution time with the PAGENO card to cause page numbering to begin at a specific number. If this card is omitted page numbering will begin with one.

d. CLASSIF. This term is used to specify classification. The area provided for classification is 30 characters and may be specified at execution time with the class card. If the class card is omitted, the field "CLASSIF" will be blank.

e. BODYLINES. This term identifies a counter that is used to specify the number of body lines remaining on a page. The total number of lines per page is specified at the time the report is compiled with an entry on the format card, but may be modified at execution time with a bodylines card.

The output control cards, (DATE, PAGENO, CLASS, and BODYLINES) discussed in greater detail later, in section eleven, Output Con Cards.

f. Conditional Statements.

(1) Many of the specifications to be described may be conditional and are comparable to the term in retrieval language ditional statements are of the general form:

... IF, parameter, condition, parameter, AND/OR, param condition, etc.

These conditional statements are used to condition the printing lines, or results of computations.

(2) Generally, the parameters may be any field or gro except that both parameters must not be periodic fields or group different sets. The last parameter may also be previously defin literals, alphabetic literals (@literal@) or numeric literals. first parameter must be a previously defined literal or field.

(3) The conditions which may be used are similar to th in retrieval and are listed below.

Negation	Greater than	Less than	Equal to	Cha Pre
NOT	GREATER	LESS	EQUAL	CHA
NE (a special case of not equal)	LATER	EARLIER	EQUALS	CHA
	AFTER	BEFORE	EQUALING	CH
	GT	LT	EQ	

(4) Certain other words may also be included to improv ability. These are listed as "noise words."

Noise Words

IS

THAN

THE

TO

(5) The conditional statement will be tested using the collating sequence unless both parameters are numeric. In using a betic parameters in a conditional statement, care should be taken

parameters are of the same length. If both parameters are numeric, an algebraic comparison will be used. A parameter is considered numeric if it is a numeric literal, the result of a computation, or a data field or group which has a numeric input type in the file format table.

(6) The output program examines the conditional statement in the following manner:

(a) If an "AND" or "IF" term is satisfied, the following "OR" terms are not processed. The next term to be checked is another "AND" term.

(b) If an "AND" or "IF" term is not satisfied, succeeding "OR" terms are examined until one is satisfied. The remaining "OR" terms are not checked, and the next term to be checked is the next "AND" term.

(c) If an "AND" or "IF" term is not satisfied, and no "OR" term is satisfied prior to another "AND" term or prior to the end of the expression, the condition fails.

(d) If the end of the logic condition is reached and preceding "AND/OR" group is satisfied, the logic condition is satisfied.

(7) The following examples are given to illustrate the above:

Expression	Interpretation
IF A AND B	Both A and B must be true.
IF A OR B	Either A or B must be true.
IF A OR B AND C	C must be true. Either A or B must also be true.

g. Headers. The uses of conditional statements are described in greater detail when they are used in specifications.

(1) The general form for the Header specification is:

HEADERn { conditional statement
47, @ACTUAL LABEL@
47, system label
47, literal }

n is the line level number

(2) The labels or literals are located on the header line by specifying a low order (rightmost) print position for each. From our example the first header line specification is:

HEADER1, 71, @UNCLASSIFIED@

HEADER1, 103, @PAGE@

HEADER1, 11Ø, PAGENO

(3. These specifications will cause a line to be format the terms "UNCLASSIFIED" in position 71 and "PAGE" in position 103. third example for HEADER1 demonstrates the use of system labels (P/ on header lines. The cont of the system label PAGENO will be at the specified position.

(4) The header lines 2 and 3 would be specified in a sin manner.

HEADER2, 71, @AIRPORT FILE@

HEADER3, 76, @PASSENGER AND AIRCRAFT@

HEADER3, 121, @INFORMATION DATE@

(5) The specification for the fourth header line will ag illustrate the use of system labels on header lines.

HEADER4, 75, @HANDLING STATISTICS@

HEADER4, 118, OPDATE

Including the system label OPDATE on the header line will provide a in positions 108-118 (the date would be that specified on the date at execution time).

(6) When using system labels, allow sufficient space on line for the entire system field since no overlap is permitted betw specifications. For example: the print position specified for the system label CLASSIF can never be less than 30 since the length of label is 30 characters.

(7) Header lines can be conditioned by the use of the co statements discussed previously. If header lines are conditioned, parameters of the conditional statement cannot be data fields. The conditional statement must be the first specification for that line the output of the entire line is to be conditioned.

HEADER1, IF PAGENO LT 10
HEADER1, 98, @INSERT FOLLOWING PAGE CHANGES@

(8) This example would condition the first header line or basis of the contents of the system label PAGENO. If the page numbe less than 10, the phrase "INSERT FOLLOWING PAGE CHANGES" would be pr The assumption was made for this example that the PAGENO card had a of 9 and, therefore, the phrase would be printed once at the beginni the report.

(9) The previous example illustrates the use of the conditional statement at line level by which the output of the entire line is conditioned. It is also possible to have portions of lines conditioned as well. If two reports were to be produced from one RIT and the header line for each report differed on the basis of the data entered at execution time, they might be specified as follows:

HEADER1, 85, @FISCAL YEAR 1965@, IF OPDATE GT 64182

HEADER1, 85, @FISCAL YEAR 1964@, IF OPDATE LT 64183

Thus the header would contain one of the two phrases depending on the date specified (in the form YRDAY) on the date card.

8-9. LABEL LINES:

a. It is frequently necessary or desirable to place similar non-data lines in the body of the report containing column identification or some other supplementary information. The general form for these LABEL line specifications is essentially the same as those for HEADER lines.

LABELn { conditional statement
47, @ACTUAL LABEL@
64, system label
75, literal }

n is the label level number.

b. All of the discussion of header lines is applicable to label lines with these additional specifications:

The parameters of the conditional statements may be data fields.

LABEL1, IF STATE CHANGES

LABEL1, 14, @STATE@

This example would cause the label line to be put out only if the data field called "STATE" changed from a previous value.

c. These conditional statements can also be used in connection with individual phrases or portions of the line as explained with header specifications. Care should be taken when using the conditional statements on portions of lines because if all portions of a line were conditioned as in the following example and none of the conditions were satisfied, a blank line would result.

LABEL1, 47, @STATE@, IF STATE CHANGES

LABEL1, 59, @COUNTY@, IF COUNTY EQUALS @LAKE@

LABEL1, 90, @POPULATION@, IF POP GT 1000000

d. For label lines associated with lines containing periodic d two options are available. If the label line were to be repeated for each physical line containing the periodic subset(s) until the end of set(s) is reached, the specification would be:

LABEL1, PERIODIC

or

LABEL1, PER

If the line is to appear only once prior to the periodic line, the en "PERIODIC" or "PER" would be omitted.

e. Both line conditional statements and/or the periodic statem must be specified before the specifications for the contents of the label line.

> Label lines may be associated with data lines so that the label lines appear only when the line is printed or they may be independent of these lines. Each label must have a level number of one or two digits, and labels and data lines must follow one numbering sequence. A label preceding a data line and having the same number as the line will be printed only when the line is printed.

In the example:

LABEL1 . . . . . .

LINE1 . . . . . .

LABEL2 . . . . . .

LABEL3 . . . . . .

LINE3 . . . . . .

LABEL1 and LABEL3 would be printed only if LINE1 and LINE3, respectiv were printed. LABEL2 would be independent of data and would be print in sequence. It is not necessary that the numbering sequence be concurrent, only that it is in ascending sequence.

f. Two or more label lines may be associated with one data lin by adding an alphabetic character to the level number.

LABEL2A, 17, @DATE@

LABEL2B, 19, @DAY MO YR@

LINE2, 19 DATER

g. The previous example illustrates two label lines associated with one data line and would be printed as:

DATE

DAY MO YR

30 10 64

h. This technique may be used only with body label lines (those specified by LABEL) and, since they pertain to one data line, should be treated logically together. Thus, each set of label lines (those with the alphabetic level indication) should have only one set of conditional statements and only one periodic mode statement even though more than one physical line is involved. To indicate that the conditional statements or periodic statement pertain to all the lines within the group, the specification should be given as:

```
LABEL2 IF . . . .

LABEL2A . . . . .

    .
    .
    .
    .
LABEL2B . . . . .
    .
    .
    .
LINE2 . . . . . .
```

i. Independent label lines are always printed unless, of course, they are conditioned and the condition is not satisfied. Dependent label lines have an inherent condition in that they appear only when their associated data lines appear. Thus, any conditional statement placed on dependent label lines is subordinate to the output of the data line.

8-10. DATA LINE SPECIFICATIONS: The primary emphasis in the specification of an RIT is the display of data fields with any editing, conversion, calculations, totals, or counts to be performed on the data.

a. Contents of a Data Line.

(1) The contents of a line may be either fields from the data record, results of calculations, or literals defined at compilation time.

When specifying data fields, either the five-character mnemonic or valid synonym, not containing imbedded blanks, may be used (multiw synonyms may be used if hyphenated).

(2) Literals are defined as being either alphabetic (bo by @ signs and up to 52 characters in length) or numeric (an integ 52 digits). A numeric literal may be either signed (± 10) or unsi (10). The means for specifying literals will be described with th specifications in which they are used.

b. General.

(1) For printed reports these specifications are given cards. The general format for these expressions is similar to the previously discussed. These specified lines are repeated for each of input unless conditionally excluded.

LINEn
- line level conditional statemer
- 47, data field
- 65, literal
- 78, @ACTUAL LABEL@
- action statement

(2) Data fields are indicated by specifying the low orde position on the line, followed by the field mnemonic (or a valid sy

LINE1, 24, STATE

LINE1, 38, AIRPORT

(3) It should be noted that a line specification does nc necessarily mean one physical line of printing per record. If peri data is specified many lines may be printed from one line specifica

c. Conditional Statements on a Data Line. Data line specifi may be conditioned as a whole or may be conditioned by portions.

LINE1, IF STATE CHANGES

LINE1, 24, STATE

The above example demonstrates the conditioning of a complete line. specifications for LINE1 that follow would print only if the data f "STATE" changes.

LINE1, 24, STATE, IF STATE CHANGES

This example shows the conditioning of only one portion of a line. The data contents of the field "STATE" will print only when the field changes. Other specifications for this line will not be affected by this condition.

8-11. TRAILER LINES: The specification of trailer lines follow the same rules that are followed for header line specifications. The card type is "TRAILER."

8-12. REVIEW - DEVELOPMENT OF A REPORT INSTRUCTION TABLE:

a. Report specification cards are used to describe in detail the format of a desired report.

b. The report specification cards are in free format with the card type as the first entry. Columns 1 to 71 are used for entries, with columns 73-80 used for identification and card sequence.

c. All output positions are specified by low order (rightmost) position.

d. Conditional statements may be used to allow selective printing or outputting of reports.

e. The logic of conditional statements is similar to the logic of the retrieval language.

f. System labels are provided to allow specifying certain parameters at run time.

g. File card(s) identifying a file must precede the specifications against that file.

h. The format card specifies the size, bodylines, and spacing for the print format.

i. Up to nine header lines may be specified for a report.

j. Data may not be specified on header lines. Data fields may not be used to condition header lines.

k. Label lines are specified similar to header lines except that data fields may condition label lines.

l. Line cards are used to place data fields in a report.

m. Literals may be inserted in data lines to aid in defining data.

SECTION NINE

SPECIFICATIONS FOR A PRINTED REPORT

This section will describe processing and format specifications that not appear in the simple output format. It will include "TITLELINES for filling a report, "FINALLINES" for summary information, conditio exclusion of data, conditional spacing, overflow lines, and other fo controls that are not required for a simple output report format. A metic processing to include totals, counts and computations will als included in this section. Also, specifications for punched card and magnetic tape reports will be described in this section.

9-1. TITLELINES: The specification of a TITLELINE enables the user give a title to the report. TITLELINES will be printed once per rep and will appear at the beginning immediately following the HEADER li and may contain the same type of information as the header lines.

TITLELINE1, 40, @THIS REPORT WAS@

TITLELINE1, 53, @COMPLETED ON@

TITLELINE2, 50, OPDATE

9-2. FORMAT CONTROL:

a. Spacing.

(1) The normal spacing for a report can be indicated on t format card as previously discussed. This spacing should be the predominant spacing throughout the report. Special spacing to repla the normal spacing or for special conditions may be indicated by the space card. The general format of the space card is:

SPACE n { conditional statement / format control statement }

(2) Normally, the conditional statement will not be neces and the spacing action will be specified as:

SPACE 5

This spacing will override the normal spacing whenever the line (lab header, titlelines, etc.) preceding this space card is printed.

(3) The conditional statement can control the spacing act as in the following example:

LINE1 . . . . . .

SPACE 2

SPACE 5 IF AIRPORT CHANGES

LINE2 . . . . . .

This illustration provides for double spacing unless the field airport (airport name) changed; then, the spacing would be 5 spaces (it would override "SPACE 2").

(4) Format Control statements have some limitations. If spacing between two periodic lines is desired to be different from spacing of different subsets of the same line, a label line must be inserted for the second periodic line and spacing must be conditioned printing of the label line.

(5) The Specifications:

LINE1

SPACE 2

SPACE 3 BEFORE LINE2

LINE2

would cause triple spacing between the printing of each subset of line 1 and not just between the last subset with line 1 specifications and those with line 2. A SPACE 1 card following the SPACE 2 card gives the same results.

(6) This may be properly handled by:

LINE1

SPACE 2

SPACE 3 BEFORE LABEL2

LABEL2

LINE2

SPACE 2

(7) Special spacing may be desired between records. To accomplish this another format control statement is used.

SPACE 7 BETWEEN RECORDS

This type of spacing expression will cause the specified spacing to take place only between each data record. The specifications must follow immediately the last data line for the record. Each of the above examples could be conditioned; however, if the action is conditioned, the conditional expression must be placed last.

b. Eject.

(1) Another means of controlling the format of a report is b the means of the eject statement. This statement will cause the progra to eject to a new page when the expression is encountered, printing any trailer and header lines before proceeding to the next specification.

EJECT { conditional statement / format control statement }

(2) The above example illustrates the general format of the eject statement. If unconditional, the action will be taken each time the statement is encountered. The conditional statement can be used as in the following example.

EJECT IF BODYLINES LT 5

This statement will cause the page to be ejected if the number of lines remaining on a page is less than five.

(3) The two forms of the format control statement can also used with eject statements.

EJECT BEFORE LABEL5

EJECT BETWEEN RECORDS

9-3. FORMAT CONTROL USING THE CARRIAGE CONTROL TAPE:

a. In addition to the methods of controlling the format of a re already discussed, the carriage control tape on the printer may be use The printer may be skipped to any channel on the carriage control tape with the use of the skip specification card. The card has the format:

SKIP TO n { format control statement, / conditional statement }

b. The n is the number of the channel to which the printer wi skip. This action takes place immediately before the next line card i acted upon. Care should be taken when using this option, since the bo lines counter is not decremented as the result of the skip action. The body lines counter must be adjusted by the means of the reset card if format is controlled by both skip and spacing action.

c. The skip specification may have conditional statements and format control statements as previously discussed with the space and eject specifications.

9-4. USE OF THE RESET CARD:

a. The reset card can be used to reset any result area or any numeric literal to a particular value. It may be placed anywhere in the specifications where the action may be necessary. The general format of the card is:

RESET area, conditional statement

or

RESET area TO____, conditional statement

The first statement is used when resetting an area to zero. The second statement will reset the area to the value specified. The resultant area will have true sign and leading zeros. The reset statement may also be used on a line, card, or record card.

b. The re et card is useful to reset a numeric system label.

RESET BODYLINES TO 10

RESET PAGENO

The first example will reset the body line counter to ten, while the second example will reset the page counter to zero. The ability to reset these system constants allows more flexibility of format control under the control of data. For instance, the page number could be reset to a value based upon a change in a control field to produce separate volumes of a report.

c. Since the page counter is incremented after the trailer lines are printed, the location of the page number will determine when and to what value the system label PAGENO is reset.

(1) Page Number on Header Line. The system constant PAGENO should be reset to one less than the desired value and, if an eject statement is present with the same condition, placed on the line preceding the eject card.

```
FORMAT. . . . . .

HEADER1. . . . . .

LINE1. . . . . .

LINE1   RESET PAGENO IF COUNTRY CHANGES AND COUNTRY EQ @UK@

EJECT IF COUNTRY CHANGES AND COUNTRY EQ @UK@

TRAILER1
```

(2) Page Number on Trailer Line. PAGENO should be reset to desired value and placed after at least one data line specification.

FORMAT. . . . . .

HEADER1. . . . . .

LINE1. . . . . .

RESET PAGENO TO 1 IF COUNTRY CHANGES AND COUNTRY EQ @UK@

LINE5. . . . . .

EJECT BETWEEN RECORDS IF COUNTRY COMPLETE

TRAILER1, 47, PAGENO

(3) Reset Resultant Areas From Computations. Results of calculations, totals, and counts may be reset.

FORMAT. . . . . .

LINE1, COMPUTE, TOTALMIL EQ TOTAL OF MILEAGE IF ORGAN EQ @ARM

LINE2 IF COUNTRY COMPLETE

LINE2, 47, TOTALMIL

LINE2, RESET TOTALMIL

The file for this example is composed of trip information for various organizations in the countries of interest. The example illustrates how the total of all mileage for the army in each country might be specified.

d. In these examples, the conditional statement "IF_____ COMPLETE" has been used. The use of this expression is discussed in this section under the heading "Summary Reports," paragraph 9-17.

9-5. OVERFLOW LINE SPECIFICATIONS:

a. Overflow lines are printed after the header lines on a page which has been reached by overflow from the previous page. The overflow lines will be printed only if the next data line of the report format is not the first data line specified. Overflow lines may contain both data and literals. Care should be taken when including data items on overflow lines in a multifile report, as the overflow might occur in any of the file's specifications. It is recommended that data items be placed in literals with a move statement; however, a series of overflow lines may be specified and made mutually exclusive by the use of conditional statements so that the proper overflow line is printed when the corresponding file is being processed.

b. The format of the specification is the same as for line cards except the card type is overflow.

```
                    Line Level Conditional Statement
                    47, Data Field
OVERFLOWn           47, Literal
                    47, @Actual Label@
                    Action Statement
```

c. The lines are normally specified following the header lines, but may be specified anywhere after the header lines and before final lines and/or trailers. In any case, the spacing should be relative to the last header line.

d. If a report was desired where the normal spacing between the last header and the first data line was five spaces but, when the overflow condition was satisfied, the overflow line was to be inserted between the header line and the first data line, the specifications would be:

```
HEADER3

SPACE 5

SPACE 2 BEFORE OVERFLOW1

OVERFLOW1

SPACE 3

LINE1

LINE2
```

e. In the above specifications, overflow 1 is never printed immediately before line 1. In the case where line one follows the header line, there would be 5 spaces before the line is printed; if the overflow is printed, there would be 2 spaces before the overflow line and 3 spaces after.

9-6. <u>THE DEFINE CARD</u>: The define card can be used to specify the length of an area and give it a name. Those areas are useful for: (1) work areas for computations and (2) result areas for computations for which the system-produced lengths are inadequate and (3) define a literal with a specific value or name that might be used repeatedly.

```
DEFINE WORKAREA, 4

DEFINE TITLE, @THE OUTPUT SYSTEM USERS MANUAL@
```

a. The first example will cause a work area of 4 digits to be created and associated with the term "WORKAREA." It will be treated as a numeric field for all output system functions.

b. The second example will define the literal "THE OUTPUT SYSTEM USERS MANUAL" and the phrase can be referenced with the term "TITLE." Literals defined in this manner will be considered alphabetic.

c. The names assigned to these literals can be any name <u>except</u> those with special meaning to the output program.

d. The literals defined in the above manner will be treated as fixed fields. They can be associated with particular periodic sets or a periodic literals in general as in the following examples:

DEFINE, SET 4, AREAONE, 10

or

DEFINE, PERIODIC, SCALE, @1:1,000,000@

DEFINE, PER, ALTITUDE, @2000 FT@

e. The first example defined a 10-digit work area, "AREAONE," for periodic set 4. The next two examples are two alternative means of sayi that "SCALE" and "ALTITUDE" are periodic literals. A periodic literal f a specific set will be repeated (if specified to be printed on a line) until the fields in the set have been exhausted. A general periodic literal will be repeated until all periodic sets specified on that line are exhausted.

f. An alphabetic literal defined in this manner must be no longer than 52 characters; the length of the numeric literal must be specified in 3 digits or less.

9-7. <u>STORING DATA FOR LATER USE</u>:

a. If, for some reason data from one record is required for later use in a report, it may be stored in a literal with the use of the move expression. The general format for this statement which is placed on a data specification (LINE, CARD OR RECORD) is:

LINE1 MOVE parameter TO literal

b. The parameter may be a field or a literal; the area where the parameter is moved must be a literal equal to or greater than the parameter (size). If the literal is undefined, it will be defined by the output program with the length equal to the length of the parameter.

Partial field notation can be used here.

LINE1, MOVE COORD 1-2 to DEG 1-2

Since a word mark is needed to stop a move and none is set in the middle of a field, it is not recommended though legal to use the following stat ment unless there is a subsequent move into the high order positions of the literal.

LINE1, MOVE COORD 7-9 to DEG 3-5

Subroutine conversion can also be done here.

```
LINE1, MOVE COORD SUBRT CRD8S TO COORDINATE
```

This specification might be used if conversion is needed before a comparison or computation.

9-8. CONDITIONAL EXCLUSION OF DATA RECORDS: Data records may be conditionally excluded from a report or in one of the output media with the use of the omit specification. This statement enables the user to be selective in the processing of records for any one of the specified output media, or both.

a. The production of an index, on punched cards, for the airport file is an example of its application. The following specifications illustrate the manner in which a report would be specified where only the data on airports in the state of Illinois is to be included in the printed report and an index of the pages where each city began is to be punched.

```
FILE AIR A

OMIT IF STATE NOT EQUAL @ILLIN@

FORMAT PRINT

-------
-------
-------
-------
FORMAT PUNCH

OMIT IF CITY NOT CHANGE
CARD1, 30, CITY
CARD1, 78, PAGENO
-------
END
```

The omit statements in the previous example eliminate the necessity for having each specification conditioned with the same statement.

b. The correct sequencing of these statements is important when they are used to select data records for processing. The example used here illustrates the case where only one file is contained in the report. When used in this instance, the statements placed between the file card and the format card pertain to all formats; the statements placed after a format card pertain only to that format.

c. When more than one file is contained in a report (with one or more formats) the situation is more complex. Appendix E - card sequencing - discusses the multifile reports. Omit statements are discussed there as to their significance to the production of such reports.

d. Care must be taken in the meaning of the "TOTAL OF _____" "COUNT OF _____" statements when used in conjunction with condition exclusion of data records from a report. This is discussed in this sec under "Additional Arithmetic Operations," subparagraph 9-22.

9-9. STOPPING THE REPORT CONDITIONALLY:

a. The production of the report can be stopped at any time by me of the stop statement. This is a conditional statement and should be t first statement following the file card for the file to which it pertai

```
FILE AIR A

STOP IF STATE EQUALS @WISCO@
-------
-------
-------
```

b. When the condition is satisfie', the report is terminated. I the previous example the report would be stopped when the state was Wisconsin. The record which contained Wisconsin would not be processed

c. Care should be taken that this specification is placed in pro sequence.

```
FILE AIR A

FORMAT PRINT
-------------------------------------------------------------------
-------------------------------------------------------------------
-------------------------------------------------------------------

FORMAT PUNCH

STOP IF STATE EQUALS @WISCO@
-------------------------------------------------------------------
-------------------------------------------------------------------

END
```

d. If this statement were placed as shown above, the record containing Wisconsin would be printed and, since the condition is satisfied the report would then stop.

9-10. ADDRESSING PORTIONS OF FIELDS:

a. If a portion of a field is desired for output or for use in th other specifications, the portion would be indicated as in the following form:

. . . . FIELDA x-y

where x is the high order and y is the low order position of the field

b. This notation can be used in all specifications where previously defined literals and fields are referenced with one exception - a partial field cannot be specified when a system subroutine (one specified in the FFT) is to act on that field.

LINE1, 47, FIELDA, 1-4

LINE1, 38, TOTAL OF FIELDB, 5-6

LINE1, 80, FLDC 1-4 DIV FLDD 5-9

c. The above examples illustrate the specification. The partial fields are treated in every way as the whole field would be except as mentioned above. This notation has a special significance when printing a Retrieval answer tape and is discussed under "Addressing the Sort Key," below.

9-11 ADDRESSING THE SORT KEY:

GRP ID	REC TYPE	QUERY NO.	FILE SEQ NO.	SORT INFORMATION FROM DATA RECORD	ANSWER COUNTER	FILE NAME
1	2 3	4 7	8	9 33	34 38	39 43

SORT KEY

Two means have been provided to access information in the sort key of the records on the answer tape.

a. Partial Field Notation.

LINE1 IF SORT 5-10 CHANGES

The key word for the sort key is "SORT," and with the use of the partial field notation, any portion can be referenced.

b. Named Fields. The file name in the answer record can be referenced by the term "FILENAME;" the query number, by the term "QUERYNO." Either of these two means can be used in the same way as fields.

9-12. EDIT FEATURE, SUBROUTINES, AND TABLES:

a. These data fields can be put out as they appear in the file, in which case, the specification would be as it appears above. Data fields can also be edited using the 1410 editing feature or converted by a conversion table or subroutine. In most cases these edit words, tables, or subroutines have been specified by the file designer in the File Format Table (FFT). To indicate that the field is to be acted upon by the edit word, table, or subroutine specified for it in the FFT, the field specification would be:

LINE1, 47, YEAR, EDIT

LINE1, 24, STATE, TABLE

LINE2, 61, LOCATION, SUBRT

b. If no such indication were present in the FFT or if another word, table, or subroutine were desired, the required operation can b indicated as follows:

LINE1, 47, YEAR, EDIT @19ƀƀ@

NOTE: Do not use the letters "C" or "R" in edit words.

c. In this example, the edit word is indicated by enclosing th actual word in @signs. For a complete discussion of editing refer to File Generation and File Maintenance Manual, pages 3-10 through 3-17.

d. The specification of a subroutine or table is similar.

LINE1, 50, COORD, SUBRT, CRD2S

LINE1, 70, STATE, TABLE, STATS

e. These examples illustrate the use of the subroutine "CRD2S" the field known as "COORD" and the conversion table "STATS" on the fi known as "STATE." Care should be taken when using this type of speci fication to provide for the proper output length on the line. The le of the output, if not known, will be assumed to be the length of the for the purposes of checking for the overlap of fields on the line.

f. Examples of uses of edits, tables, and RIT logic to replace subroutines.

(1) To move a portion of a table function to print:

DEFINE LIT1 @ƀƀƀƀƀƀƀƀƀƀ@ (Maximum function size)

LINE3, MOVE FLTYP SUBRT TABLS TO LIT1
LINE3, 16, LIT1 1-4

If FLTYP equals P, PASSENGER would be moved to LIT1 and LINE3 position 16 would contain PASS.

(2) Rearranging a date field to make it more readable at ou time. The date in punch card form is 651215.

DEFINE, WORKAREA, @ƀƀƀƀƀƀ@
LINE1, MOVE DATE 1-2 TO WORKAREA 5-6
LINE1, MOVE DATE 3-6 TO WORKAREA 1-
LINE1, 15, WORKAREA, EDIT, @ƀƀ-ƀƀ-ƀƀ@

This would print 12-15-65.

This logic might be extended in this way
LINE1, 9, @DEC@, IF WORKAREA 1-2 EQ @12@
LINE1, 15, WORKAREA 3-6 EDIT @ØØ,ØØ@
and the printout would be DEC 15, 65.

9-13. LITERALS ON DATA LINES:

a. Literals can also be specified on a line by either the use of a label bounded by @ signs or a literal that has been previously defined.

LINE1, 47, @ACTUAL LABEL@

or

LINE1, 50, ORGANIZATION

In the latter example, the term "ORGANIZATION" has been previously defined with a define card. (See section ten.)

b. If a literal is bounded by @signs and periodic data is to be printed on the line, it will be treated as fixed in that it will appear only on the first physical line. If, however, the literal is desired on every physical line containing periodic data until the periodic set(s) is finished, then the specification would be:

LINE1, 47, @DAY MO YR@, PERIODIC

or

LINE1, 47, @DAY MO YR@, PER

c. It is also possible to tie the literal to any particular set so that the literal will be repeated only until that set is finished by specifying as in the following example:

LINE1, 47, @DAY MO YR@, SET n

n is the periodic set ID.

9-14. SPECIFICATION OF PERIODIC INFORMATION: No specifications are necessary if the periodic mode for the report is to remain the same throughout, and if the mode indicated in the FFT is the desired mode. (This is essentially for a report received from retrieval.) If, however, the mode is different from that specified in the FFT or if the periodic mode is not consistent, then the mode can be specified for each line by the means explained here. The specification for a line containing periodic information which is to be printed in the scan mode is:

LINE1, SCAN

or

LINE2, SCAN, SET n where n is the set ID.

The fi: t of the two examples states that all periodic sets are to bc in the scan mode for every reiteration of line 1 (flagged subsets onl) The second example can be used to tie the mode to a particular periodi set. If this were done, the specified set would be printed with that while the rest of the periodic sets would be printed with the mode as specified in the FFT.

a. To specify that the last n or the first n subsets are to printed the statements are:

LINE1, FIRST 5

LINE2, LAST 10

LINE3, FIRST 5, SET 5

LINE3, LAST 10, SET 6

The first example causes only the first 5 subsets of each periodic set be processed while printing line 1. The second example causes the last 10 subsets of each set to be processed for line 2. The last two examp tie the specifications to specific periodic sets. These specifications override any assigned mode.

b. If the mode for retrieval specified for a periodic set is sca in the FFT and all subsets are wanted in the report, the specifications would be:

LINE1, ALL

or

LINE1, ALL, SET n

The first example will cause all subsets to be printed for all periodic sets specified on the line. The second example ties the specification to a specific periodic set. This specification is not necessary when printing a report direct from the file.

c. The periodic mode specified in this manner will effect the out put of this line only. Thus, if fields from the same periodic set were placed on two lines, each line would have to have the mode specified. There is no need to keep the mode for a set consistent throughout the report.

d. With periodic information it is often required or preferred to have the same field (or fields) from more than one subset printed on a line. This is done by specifying each low order output location chosen for that field on the line.

LINE1, 10, 20, 30, FIELD

The above example would place the specified field from 3 subsets on line 1 in the positions indicated. The line would be repeated in this mode until the set was exhausted. If more than one field from a subset is specified, it is important that all fields from the same set be specified in the same way; that is, if more than one subset per line is indicated for one field, the specification for another field in the same set must be the same.

e. There are two main ways in which fields from the same periodic set can be displayed on more than one line. The first would be on the basis that each line is repeated until the set is exhausted and then the next line is repeated until the set is exhausted. If a periodic set contains fields A, B, C, and D then this might appear on the specifications as:

LINE1, 10, FLDA

LINE1, 20, FLDB

LINE1, 30, FLDC

LINE2, 10, FLDD

This would appear on the page as:

Subset	1	A	B	C
	2	A	B	C
	3	A	B	C
	1	D		
	2	D		
	3	D		

It might be desirable to display the above set in the following manner:

A	B	C
D		
A	B	C
D		
A	B	C
D		etc., until the set is exhausted.

This would be specified in the following manner since the lines can b considered as one group.

LINE1A, 10, FLDA

LINE1A, 20, FLDB

LINE1A, 30, FLDC

LINE1B, 10, FLDD

The only limitation that must be placed on this method of specifying periodic sets is that the mode for each set (scan, etc.) and the numb subsets per line must be the same in each line.

f. If a periodic mode is specified for a series of lines conta periodic information from the same set, it would be specified as foll

LINE1, SCAN

LINE1A, 10, FLDA

LINE1A, 20, FLDB

LINE1A, 30, FLDC

LINE1B, 10, FLDD

9-15. ASSOCIATED LABEL LINES:

a. Each of the lines in the group of lines may have associated labels or the entire group of lines may have one or more labels associ with it.

LABEL1A, 47, CLASSIF

LABEL1B, 50, @ACTUAL LABEL@

LINE1B, 10, FLDA

LINE1B, 20, FLDB

LINE1C, 30, FLDC

In the above example, the label lines 1A and 1B are associated with th first data line (LINE1B) that follows. The level sequence given in th example follows the rule which states that when preceding from a label line with an alphabetic level to a data line (LINE) with an alphabetic level, the level of the data line must be the same or greater than the preceding label line.

```
LABEL1A, PERIODIC

LABEL1A, 26, CLASSIF

LINE1A, . . . . . .
  .
  .
LABEL1B, PERIODIC
  .
LINE1B, . . . . . .
  .
```

This example illustrates a group of lines which have label lines associated with each line. Note that since the labels are to be repeated with the data lines each time they are printed, they have been specified as periodic.

b. Each of the label lines or groups of label lines may be conditioned provided that the conditional statement appears as the first specification for a series of contiguous label lines. The output of these lines can be conditioned with the use of the conditional statements described previously.

c. The only restriction placed upon line level conditional statements (those which condition the output of the entire line) is with periodic lines. A periodic line containing more than one subset per line cannot be conditioned on a field from the same set. Also, as a general rule, lines with alphabetic level indication should not be conditioned. (Specific exceptions to this rule exist which are explained in section ten.)

9-16. SPECIFICATION OF VARIABLE INFORMATION: Variable information such as remarks can be indicated by:

```
LINE1, 8-100, REMKS
```

This specification provides for data from the variable set to be printed from position 8 through 100. The information from the set will be repeated in this format until exhausted.

9-17. SUMMARY REPORTS: Two special features have been incorporated into the output system to facilitate the production of summary reports. These are "FINALLINE" (FINALCARD and FINALRECORD) and the "IF_____COMPLETE" conditional statement.

a. Summary information is desired in many cases not only involving the entire report but also on portions of a report. Under normal circumstances, actions conditioned on the presence of a change in a field are processed with the data from the new record present. This is desirable whenever an action on data from a record is conditioned on a change from the previous record.

LINE1, IF STATE CHANGES

LINE1, 47, STATE

The fie'd "STATE" from the new record would print when "STATE" change

IF_____COMPLETE STATEMENT

b. For some summary information application, it is desirable t condition the action on the basis that a certain type record is compl An example would be to total the number of aircraft of a certain type The result would be placed on a separate line before the data from th new record is printed (beginning with the LINE1 specifications). Thi in essence, a change in the field, but the action desired is differen

c. Whenever a format control statement includes the conditional _____ COMPLETE", the statement must also include "BETWEEN RECORDS". I example:

SPACE 3 BETWEEN RECORDS IF STATE COMPLETE

9-18. ACTION STATEMENTS ON A LINE CARD:

a. Simple totals and counts of data fields can be specified as

LINE1, 50, TOTAL of A/C-CAP

LINE1, 60, COUNT OF AIRFIELDS

The two examples above would print the total aircraft capacity in posi 50 (right justified) and the count of the airfields in position 60. T assumptions made here are that the synonyms A/C-CAP and AIRFIELDS exis for the fields and that aircraft capacity (A/C-CAP) is a numeric field.

b. These statements specify the result of the action not the pe formance of it. The total or count would be one which had accumulated the beginning of the report or since its last previous printing. This be a total or count by record unless conditional printing is specified.

c. Si le calculations can be specified by:

LINE2, 100, Factor Operator Factor Operator
Factor etc.

d. The calculation would be performed left to right and the res will be printed in position 100. The factors may be field names, numer literals, or a literal that has previously been defined. The operators that can be used are:

Addition	Subtraction	Multiplication	Divisi
ADD	SUB	MUL	DIV
PLUS	MINUS		
+ (12 punch)	- (11 punch)	* (11-4-8 punch)	/ (0-

e. The results of either totals, counts, or calculations of this type can be conditionally printed on a line by the use of conditional statements.

LINE1, 50, COUNT OF AIRLINES IF STATE EQ @ILLIN@

LINE1, 60, PPSCP MUL PDAY IF PPSCP GT 50

The above examples will cause the count of AIRLINES to be printed for each record for the state of Illinois and the number of passengers (PPSCP times PDAY) if the percentage is greater than 50 percent.

f. The results of totals, counts, or calculations of this type can also be edited or be acted upon by a subroutine or table.

LINE1, 80, TOTAL OF PPSCP, EDIT @ƀƀ0%@

This example would cause the result of the totaling of PPSCP to be edited with the edit word provided.

9-19. RESULT AREAS:

a. When specifying the performance of totals, counts, and computations in this format, the lengths of the result areas are determined by the program as follows:

TOTALS	Twice the length of the field being totaled
COUNTS	Six digits
COMPUTATIONS	Addition - length of the longest factor plus one
	Subtraction - length of the longest factor plus one
	Multiplication - sum of the lengths of the two factors
	Division - equal to the length of the dividend

NOTE: Each of the above lengths is determined by taking the factors in pairs.

b. The results of the above specification will be printed with leading zeros suppressed and without sign unless an edit word has been provided. For totals and counts the area in which the accumulation takes place is cleared to zeros once the total or count has been printed. The specification of these actions by these methods means that the accumulation action will take place for every occurrence of the fields in the record unless there has been an overriding periodic mode specification. In the latter case the total, count, or calculation will be performed under the conditions set by the line.

c. For example, if a total were specified for a field of a perio set and the mode for that set were scan, only the fields from the flagg subsets would be part of the total. Obviously these mode consideration would apply only when outputting a retrieval answer tape.

9-20. COMPUTATIONS WITH LITERALS: Another means of specifying addition or subtractions to or from predefined literals is by the following:

LINE1, ADD parameter TO literal

LINE1, SUB parameter FROM literal

The parameter may be numeric fields or numeric literals. The literal m be either a system label or an area which has previously been defined. These statements can be conditioned.

9-21. FINALLINES: It is possible to specify "FINALLINES" that will be printed only at the conclusion of the report. These lines cannot contai data from a record unless it has been stored in a literal at some previc time. The normal use for this type of line would be for su operations as totals and counts or other types of summary data. After the last record has been processed, any "FINALLINES" will be printed and then the trailer lines will be printed.

FINALLINE1, 10, @TOTAL@

FINALLINE1, 17, TOTAL OF PASSENGERS

The above specifications would place the total of all passengers for all records that have been processed in position 17 preceded by the word "TOTAL." The conditioning of these lines follows the same restrictions as header lines in that the parameter of the conditional statement cannot be data fields.

NOTE: Summary information may be obtained on portions of the report.

9-22. ADDITIONAL ARITHMETIC OPERATIONS: In cases where the results of totals, counts, and computations are required for a variety of reasons or the actions of the arithmetic statement rather than the output of the result must be conditioned, another form of arithmetic is required. The three methods are: expansion of the "TOTAL OF _____" statement, the "COMPUTE" statement, and the "COMPUTE" card.

a. Expansion of the "TOTAL OF_____" Statement. This form allows the user to specify totals and counts in the manner discussed in section eight, but in addition, the result may be saved for further reference.

LINE1, TOTAL OF AIRCRAFT IN TOTACRFT

LINE1, COUNT OF AIRFIELD IN CNTAFLDS

LINE1, 30, TOTACRFT DIV CNTAFLDS

The above example illustrates the means by which a total and count can be made and their results divided to produce an average. This average is then printed in position 30. Notice the absence of print positions in the first two statements; output locations could be included if the total and count were to be printed.

(1) The internal procedure for the previous example would be to total the aircraft field and move the results to TOTACRFT, count the airfield and move the results to CNTAFLDS, and then perform the division. The internal totaling and counting accumulation areas will be reset to zero after the move has been performed.

(2) The areas specified for the results can be defined as work areas with define cards.

DEFINE TOTACRFT, 5

DEFINE CNTAFLDS, 3

These areas, if not defined in the above manner, will be defined by the output system using the standard lengths.

(3) These statements specify the results of the operation rather than the action of it. Totals and counts specified in the method mentioned here take place prior to the processing of the first format specification. The use of omit statements can therefore affect the totaling and counting operations.

(4) If the omit statement is placed following the file card but before the format card, the total or count will take place on all records that satisfy the condition(s).

(5) If the omit statement is placed after a format statement, the total or count will take place on all records regardless of the conditions specified in the omit expression.

(6) Another specification which will affect these operations is the periodic mode specification for a line. The total or count will take place on all records according to the periodic mode indicated for the line which contains the total or count specification.

b. The Compute Statement Form. The compute statement form of arithmetic operation can be used in cases where the computed results are needed for later use, for unusual accumulation of totals and counts, and where the performance of the action must be conditioned.

(1) The general form for a total and count is:

LINExx, COMPUTE result area EQ TOTAL OF _____

LINExx, COMPUTE result area EQ COUNT OF _____

(a) These statements would cause the total or count act to be performed every time the line is printed. The result will be pla in the area designated by the literal name. The next time that the tot or count is made, the value will be added to the result area (TOTAL) or result area will be increased by one (COUNT).

(b) The resultant area may be defined as a work area wi a DEFINE card or the user can allow the area to be defined by the syste using the standard lengths.

(2) The general form for computations is:

LINExx COMPUTE result area EQ factor, operator, factor operator, etc.

(a) The factors can be either field names, previously defined literals, or numeric literals.

(b) The computation proceeds from left to right with integer arithmetic. Thus, the factors might have to be scaled to provi the desired accuracy. Note that the result is not printed or reset to zero automatically. The actions may be performed by the normal print specification with the resultant area and by the reset command.

(c) Any of the above methods of specifying arithmetic operations may be made conditional by the use of the conditional statements previously described. This will cause the action rather than the output of the result to be conditioned.

c. The Compute Card.

(1) The compute card is needed for those cases where it is n possible or convenient to put the compute statement on a line, card, or record specification. An example where it would be used would be if so calculation were performed on a data record and the record conditionall included in the report based upon the results of the computation. Supp one wishes to include all airports in the airfield file (file mnemonic AIR A) that are serviced by 5 or more airlines. The specifications to accomplish this would be:

FILE AIR A

COMPUTE CNTAIRLINES EQ COUNT OF AIRLINE

OMIT IF CNTAIRLINES LT 5

(2) Airline names are contained as subsets in periodic set t The compute statement would count the number of airlines (i.e., subsets and place the count in "CNTAIRLINES." This literal could have been defined with a define card; however, if not previously defined, the literal will be defined using the standard lengths.

(3) Caution should be exercised when using the compute card with periodic data since the entire set is processed using the compute statement before the next specification is acted upon.

COMPUTE AIRCRAFT-CAP EQ PACCP MUL ACCAP

(4) This statement multiplies the theoretical aircraft capacity (ACCAP) by the percentage capacity (PACCP) for the particular day and would result in the literal "AIRCRAFT-CAP" containing the resultant from the computation on only the last subset.

(5) Summaries of this type are accomplished through the use of the "IF_____COMPLETE" conditional statement. The following example assumes that a request from the AIR A file is ordered by state and that the total number of passengers handled by each state is wanted in the report.

LINE1, STATE, TABLE

LINE2, COMPUTE NUMPASS EQ PASS-DAY MUL PPSCP

LINE2, ADD NUMPASS TO TOTAL-PASS

LINE2, 50, NUMPASS 1-4, EDIT @ƀƀƀƀØ@

LINE3, IF STATE COMPLETE

LINE3, 60, TOTAL-PASS 1-5, EDIT @ƀƀƀƀƀØ@

LINE3, RESET TOTAL-PASS

(6) In this illustration, the theoretical passenger capacity per day is multiplied by the percentage passengers for each day and the result is added to a literal to achieve a running total of the numbers of passengers. Then, when the state is complete, line 3 will be printed containing this total. The literal is then reset to zero to prepare for similar operations in subsequent states. Line 3 will be printed each time a change occurs in the "STATE" field <u>before any lines containing</u> information about the next state are printed. The line will also be printed at the end of the report.

(7) Any specifications that can be placed on a normal line may be placed on lines of this type; however, data fields will be from the last record rather than from the record in which the change occurred.

(8) Note that the specification differs from the "IF_____ CHANGES" conditional statement in that the latter would cause printing of a line on the first occurrence of a state while the "IF_____COMPLETE" statement would cause printing after the last occurrence.

(9) "IF_____COMPLETE" conditionals may also be specified at field or action level; but only if the line on which it occurs is also

conditioned by an "IF_____COMPLETE." Consider the case of a file of records of cities in the world which contains population, county, stat and country. One may obtain totals of population by the various subdi in the following manner:

LINE3, IF COUNTY COMPLETE

LINE3, 9, @TOTAL FOR@

LINE3, 20, COUNTY

LINE3, 26, TOTAL OF POPULATION

LINE3, 30, STATE IF STATE IS COMPLETE

LINE3, 36, TOTAL OF POPULATION IF STATE COMPLETE

LINE3, 40, COUNTY IF COUNTY COMPLETE

LINE3, 46, TOTAL OF POPULATION IF COUNTRY COMPLETE

The above line would be printed as follows if only COUNTY changed:

TOTAL FOR FAIRFAX 125,017

if both state and county changed, the line would be:

TOTAL FOR FAIRFAX 125,017 VIRGINIA 9,612,413

and if county, state, and country changed:

TOTAL FOR FAIRFAX 125,017 VIRGINIA 9,612,413 US 190,013,214

9-23. SPECIFICATIONS FOR PUNCHED OUTPUT: The specifications for punched output follow essentially the same rules as the specifications for printed output. There are a number of differences due to the nature of punched output that will be mentioned.

a. Format. The specifications for punched output are given separately from other formats and are preceded by a format card.

FORMAT, PUNCH, SIZE, 80

The size specification (keyword "SIZE") can normally be omitted and will be assumed to be 80 columns if this is done. Other sizes can be specified if it is desired. The output program will check the specified output locations against the size specification to see that the size is not exceeded.

b. Specifications For Card Layout. The specifications for card lay containing data fields, literal, etc., are given on input cards with "CARD as the card type.

CARD1, 47 STATE

The contents of these specifications are the same as mentioned in the discussion of line specifications under printed output.

CARDn
- card level conditional statement
- 47, data field
- 65, literal
- 78, @ACTUAL LABEL@
- action statement

Areas referenced in the preceding formats can be referenced also in punched formats provided that care is taken that the areas are not cleared before they are referenced in the succeeding format. Thus, the results of totals, counts, and calculations, as specified previously, can be used only once.

c. Title Card.

(1) Title cards can be specified with the use of the "TITLECARD" specification. The same criteria must be followed for these cards as with "TITLELINE" specifications. Similarly, final cards can be specified with "FINALCARD" specifications.

(2) The discussion relative to format control is not applicable to punched output.

(3) A punched format example is included in sample problem No. 2, appendix G.

(4) The following example of two position alpha sequencing on card output is shown for its direct application, as well as for variations that may have other applications.

DEFINE, PER, CNTR1 @ØØ@

CARD1, ADD @Ø1@ TO CNTR1

CARD1, 80, CNTR1 SUBRT TAB1S

TAB1S is a subroutine which when given a two digit number produces a two character result. For example:

01 becomes AA

02 is AB

27 is BA

53 is CA

etc.

(5) Here the counter (CNTR1) will store the count in numeric, but by using the table (TAB1S) the output sequence is indicated in alphabetic symbols. This can be increased to three positions by expanding the table: ØØ1 is AA, etc. A three position alpha table could be used for 676 different sequence symbols.

9-24. SPECIFICATIONS FOR MAGNETIC TAPE REPORTS:

a. Format. (Refer to figure 7-5) The format specifications for magnetic tape reports also follow the same rules as for printed reports. The basic format control criteria are specified on the format card with keywords in the following general format.

FORMAT, TAPE, NAME, SAMPLEOUT, RETAIN 430, RECORD 1643, BLOCK 3286

Keyword	Function
NAME	The ten-character label name. If omitted the label portion of the header record will be blank; if less than ten characters, the name will be padded with blanks.
RETAIN	The retention date in days (up to three digits). If not specified the retention date will be zero.
RECORD	The record size (up to four digits). The Output System produces variable length blocked records (Form 4, ref: IBM Manual C28-0322). Thus the record size indicated here could not be used to specify the actual record length. It is used to specify a maximum record length allowable. This maximum specification would include the four-character record count and a one-character record mark. If nothing is specified the maximum size will be 200 characters.
BLOCK	The block size (up to four digits). If not specified the block size will be assumed to be the record size plus four (to allow for the block count) or the system standard of 1000, whichever is larger.

b. Record Card.

(1) The specifications for each record are given on record input cards and follow the same rules stated in the discussion of printed reports.

```
                    { record level conditional statement
                    { 47, data
RECORDn             { 65, literal
                    { 78, @ACTUAL LABEL@
                    { action statement
```

The size of each output record is determined by the largest output position specified for that record plus five positions. Four positions are used to specify the record character count and one position is used for the record mark. If a record is specified as follows:

```
RECORD1     3 FLDA

RECORD1     7 FLDB

RECORD1    21 FLDC
```

The tape record produced would appear as follows:

```
*          1 2 3 4 5 6 7 8                    21      *
     ┌─────┬─────┬─────┬──────────────────────────┐
     │0 0 2 6│A A A│B B B B│C C C C C C C C C C C C C C ‡│
     │       │     │       │                          │
     └─────┴─────┴─────┴──────────────────────────┘
**   1 2 3 4 5 6 7 8 9 10 11 12                 25 26   **
     └─────┘
```

└── Record Char. Count

* Relative data position as specified on record card.

** Actual tape record positions.

The above record would be 26 characters in length as is indicated in the record character count (RCC). Note that the output positions specified on the record card do not consider the RCC. The positions specified are relative to the low order position of the RCC (position 4).

(2) In addition, "TITLERECORDS" and "FINALRECORDS" may also be specified.

(3) IBM 120 position standard header labels and 120 position standard trailer labels are written on each reel of magnetic tape for tape reports.

c. Special Field Names. The following terms apply to retriev answer tape runs only:

LOGNO	The log number from the report/request card. (4 char
GROUPID	The report or request number. (2 char.)
REQDAY	The day portion of the date on the report or request (2 char.)
REQMO	The month portion of the date on the report or reques card. (2 char.)
FILENAME	The five-character name of the file from which the cu record is taken.
QUERYNO	The four-character query number which the current rec satisfied.

9-25. REVIEW - SPECIFICATIONS FOR REPORTS:

a. The define card is used to establish system locations that useful for (1) workareas, (2) result areas, and (3) literals.

b. The omit specification allows conditional exclusion of rec

c. Portions of fields may be addressed. Also the sort key da may be referenced.

d. The "TOTAL OF _____" statement may be used for storing t result for future use.

e. The compute statement may be used where results are needed future use and where the action must be conditioned.

f. The reset specification can reset a literal or a result are zero or to any given value.

g. Summary reports are obtained through the use of "FINALLINE" "IF _____COMPLETE" specifications.

h. Computations may be performed on data with the line specifi Result areas are determined by the program.

i. The control of displaying periodic data is possible through specifications.

j. Punched card report specifications are similar to print spe cations except for format control.

k. Tape output specifications also follow same rules except fo tape format control.

SECTION TEN

SPECIFICATIONS FOR MACHINE FORMATTED REPORTS

10-1. NORMAL EXTRACT: The output system provides the user with capability for asking the program to format the label and data lines for any given report. The analyst, in designing the FFT, has already established the labels associated with each field and group in the file and specified subroutines, tables, and edit words to be used for the output of each field. Extract is only applicable when a printed output is desired. Two basic options can be specified:

a. Print All Fields in the File. A request to have all fields in the file included in the report can be given with one specification.

EXTRACT, ALL FIELDS

This specification will cause the program to format lines containing fields from the file (in the order of the field names in the FFT) with four spaces between fields and the labels from the FFT centered over each field. Control fields such as the character count and periodic set control fields are also printed. The lines in this mode are formatted so that each periodic set is contained in a separate group of lines. Each subset will begin on a new line.

b. Print Selected Fields.

(1) Any field or group in the file can be specified for output using the extract mode. The desired fields are listed on specification cards in the order they are wanted on output. As many extract cards as needed are used. When output, new lines of data are started as needed.

EXTRACT, FLDA, FLDB, FLDC, FLDD, FLDE

In either of the two modes the output system will provide a header line containing the classification and date and a trailer line containing the classification and page number. (See Section 11, "Output Supervisor Control Cards," for the procedures for specifying these items at execution time.)

(2) If the user prefers headers and trailers on the report to be different from those provided by the program, he may then supply his own. These header and trailers are written in the same manner as for normal reports and will replace any that extract might have created. Trailers are not allowed unless headers for the same report have been specified.

10-2. EXTENDED EXTRACT CAPABILITIES: Further capabilities, in addition to those stated above, have been included in the extract mode:

a. Literals Enclosed in @ Signs. Literals enclosed in @ signs may be specified. Since this information is usually placed before a data field

to amplify the data, the literal will not be placed as the last item on a line, but on the next line and prior to the data field. This will not be true if two literals are specified in a row; the first literal will be placed on the end of the line if there is room.

b. Defined Literals. Literals that have been defined with the define card may be specified. These literals will be placed on the line in the same manner as fields.

c. Labels. Labels may be specified. To override an FFT label or to provide labels for the results of computations a label may be specified by:

EXTRACT, FIELD NAME, LABEL @own label@

or

EXTRACT, FIELD NAME, LABEL AVERAGE

In the last specification "AVERAGE" has been previously defined.

d. Periodic Mode. The periodic mode may be specified for a set of lines.

EXTRACT SCAN SET 2

This specification must be on a card by itself. When encountered, the previous set of lines, if any, will be terminated and the mode will apply for the rest of the lines or until another specification for the same set. Any periodic mode specification may be used on the extract card. (See paragraph 9-14)

e. Line Termination. A period can be used to terminate a line. When encountered all lines being processed will be terminated and new lines will be started with the next term. Periods cannot be embedded in any expression (i.e., conditional and compute).

f. IF__COMPLETE. The "IF__COMPLETE" conditional statement may be used to obtain summary information based on control breaks. This statement will govern all following specifications until another "IF__COMPLETE" statement (a different field being complete) or an "AT END" statement is encountered. The previous set of lines is terminated when this statement is processed. The "IF__COMPLETE" and "AT END" statements are the only conditional statements that may be used with "EXTRACT."

g. Final Lines. Final lines may be specified with an "AT END" statement.

EXTRACT TOTAL OF AIRCRAFT AT END

This expression, as with the "IF_ _COMPLETE" statement, will govern all following specifications. The rules for line content stated in the discussion of finalline are applicable to this expression.

h. Short Form Computation.

(1) Simple totals, counts, and computes may be specified using the short form method. A maximum of five ADD, SUB, MUL, DIV or combinations of these operators may be specified for any one extract line. Otherwise there is no limit as to the number of continuous extract specifications that may be stated. Fields on these continuous lines may be split as is necessary. The alpha character "C" is not required in column 72.

EXTRACT, TOTAL OF AIRCRAFT, COUNT OF AIRFIELDS,

EXTRACT, LENGTH DIV NORNWYS, TOTAL OF

EXTRACT, POPULATION IN TOTPOP, COUNT OF

EXTRACT, CITIES IN CNTCITIES , TOTPOP, DIV,

EXTRACT, CNTCITIES

(2) This example illustrates the method for specifying these operations. The results of each of the operations will be printed in the same manner as fields, with four spaces between each result. As can be seen in this example, the operation can be specified alone or the result can be saved for future reference with the "IN____" statement. In either case the result is printed.

(3) To facilitate the production of summary reports, an assumption has been made with regard to arithmetic operations on related data fields. If a data field has been specified followed by a total and/or a count of the same field, then the total and/or count will be placed on the next line following the line containing the field.

EXTRACT, STATE . CITY, POPULATION

EXTRACT, TOTAL OF POPULATION

This would be printed:

```
STATE

ILLINOIS

CITY                POPULATION .

BLOOMINGTON            XXX,XXX

CHICAGO             XX,XXX,XXX

ZION                   XX,XXX

                 TOTAL POPULATION

                    XX,XXX,XXX
```

(4) By nature of the totaling and counting procedures this will hold true only for totals and counts of periodic fields. Totals or counts of fixed fields must be conditioned by "IF____COMPLETE" or "AT END" statements and the placing of the results will not be governed by the assumption just discussed.

(5) Another assumption regarding compute statements has been made. If a compute statement follows a total or count statement, the result will be placed on the same line as the total or count.

```
EXTRACT, STATE . CITY, POPULATION

EXTRACT, TOTAL OF POPULATION IN TOTPOP, COUNT

EXTRACT, OF CITY IN CNTCITY, TOTPOP DIV

EXTRACT, CNTCITY
```

In the above case the printout would be:

```
STATE

ILLINOIS

CITY                    POPULATION

BLOOMINGTON               XXX,XXX

ZION                       XX,XXX

TOTAL POPULATION          COUNT CITY   COMPUTE NO. 1

   XXX,XXX                   XXX          XXXX
```

(6) The label for the result can be either specified with the use of the label option (TOTAL OF PPSCP LABEL @TOTAL PERCENTAGE@) or not specified. In the latter case the label will be formed by the use of the field mnemonic preceded by the word "TOTAL" or "COUNT" as appropriate. For short form compute statements the label will be "COMPUTE NO. 1" for the first computation, "COMPUTE NO. 2" for the second, etc.

10-3. <u>REVIEW - SPECIFICATIONS FOR MACHINE FORMATTED REPORTS</u>:

a. Extract is used where there is no particular concern as to format or labels.

b. Extract statements may be used to output all fields or selected fields.

c. Headers and trailers may be specified in extract mode.

d. Labels and literals may also be specified.

e. "IF___COMPLETE" and "AT END" are the only two conditional statements allowed.

f. Arithmetic computations may be specified.

SECTION ELEVEN

OUTPUT SUPERVISOR CONTROL CARDS

The control cards designed for use with the output supervisor are described in this section. All control cards, except where otherwise noted, are in free format with the card type beginning in column 1; the other card entries follow this card type with one or more spaces between each entry or word. Commas may be used instead of, or in conjunction with the spaces. Entries may be placed in the card through column 70.

If required, sequence numbers for the control cards are punched in column 77 through 80. Columns 73-74 must be reserved for the report or request number required when outputting retrieval answer tapes.

Individual card descriptions are given here, followed by examples of the sequencing required for each source.

11-1. SOURCE CARD: This entry is mandatory for every job, except report structuring for library update (create card), and must appear as the first card of the control packet. Through this entry the output program is able to determine what the input is and where other pertinent information can be found. There are four types of source cards and, in some cases, a publish card or a report or request card is used in conjunction with the source card. An explanation and use of each follows:

a. Source Direct. Source direct is used if a report is to be produced directly from the data file. It may also be used to output a file revision error tape. The source direct requires a publish card. The publish card must be the last card of the control card group.

(1) With source direct there are two methods used for designating the publish card:

(a) To print directly from the data file and to specify the RIT (Report Instruction Table) to be used, the following entries are made:

SOURCE DIRECT

PUBLISH XXXXX (the RITID to be used)

(b) To print directly from the data file where an RIT does not exist a set of report specifications must be made and these cards placed following the publish card to create an RIT for this special report The RIT will be created on a work tape and destroyed after completion of the job. For this operation, the following entries are specified:

SOURCE DIRECT

PUBLISH SPECIAL

(2) An additional operand may be used on the source direct to specify the number of reels of input data.

SOURCE DIRECT REELS 3

This must be used wherever the last input reel does not have "EOF" in its trailer label.

b. Source File Maintenance. The source file maintenance control is used in the same manner as source direct. The publish card is required and must be the last card of the control group, and is used as follows:

(1) To print the transaction tape as the result of a file maintenance run and where the RIT is part of the library file. The control cards are:

SOURCE FILE MAINTENANCE

PUBLISH XXXXX (FMRFR or FMRDR)

(2) File maintenance transactions cannot be processed with special specifications. Two special RIT's have been created in machine language programming to process this tape. See DIAM 65-9-1, "FFS File Generation and File Maintenance," for description of FMRFR and FMRDR.

c. Source Offline Tape. The data on the offline tape is either in punched card or printed format or a combination of the two. To produce this information in its proper format, the source control is:

SOURCE OFFLINE TAPE

No other control cards may be used with this source.

d. Source Retrieval.

(1) Data written on the answer tape during a retrieval operation is probably the most common source of information producing outputs. As a rule there will be several sets of answers on this tape due to more than one request or query or report called for. Note that the source card does not have the report/request number in columns 73-74, because the source card could have control cards following it that apply to several report/requests.

(2) In order to give the user the flexibility he needs in obtaining output in any manner he requires, additional control cards such as publish (a variety of different forms), request or report may be specified along with the source retrieval control card.

(3) The following uses of the retrieval control cards are:

(a) To print all answer sets from the retrieval answer t using the RITID associated with each request or report the source card i specified as follows:

SOURCE RETRIEVAL

(b) To print a selected answer set of a request or repor a publish card is required that contains the actual request or report number in columns 73-74 of the card. The RITID on the answer tape is used to format the output. The control cards are as follows:

SOURCE RETRIEVAL

PUBLISH XX (columns 73-74)
(Report/Request No.)

(c) To print a selected answer set of a request or repor using a different RIT than is normally associated with the request or report, a publish card is required. The publish card contains the overriding RITID and the report or request number. The cards are as follows:

SOURCE RETRIEVAL

PUBLISH XXXXX (The required RITID) XX (columns 73-74)
(Report/Request No.

(d) To print a special report of a request or report answer set where no RIT exists on the library - a set of report specifications must be made and placed directly behind a publish card. A speci RIT is created on a worktape and the worktape will be destroyed after th output is produced. The control cards are as follows:

SOURCE RETRIEVAL

PUBLISH SPECIAL XX (columns 73-74)
(Report/Request No.)

(e) If all answer sets on the retrieval answer tape were to be printed using the RITID associated with the request or report, the control card source retrieval, as indicated in the first step, would be specified. However, some of the reports to be printed may be required in a different format than the RIT indicated on the answer tape. For these special reports the report or request control card from the retrie operation (or a duplicate of same) and a set of report specifications are required. The report or request number is punched in columns 73-74 of these cards. The report or request card is similar to the publish specia card and must be the last card of the control group followed immediately by its report specification cards. All answer sets will be printed eithe in the special format specified or by the RITID associated with each report or request. The control cards are as follows:

SOURCE RETRIEVAL

REPORT	XX	(Report/Request)
or		(number in)
REQUEST		(columns 73-74)

(4) In addition to the above source control cards, other control cards may be specified for use with the output supervisor. These cards may appear in any sequence of the control group except for the restrictions placed upon the publish and report or request cards. The other control cards are set out in the following paragraphs:

11-2. PAGENO CARD:

PAGENO XX (1 to 6 digits) XX (columns 73-74)
(Report/Request No.
if SOURCE RETRIEVAL)

The one to six-digit number indicated here determines the number of the initial page of the report output, subsequently incremented by one for each succeeding page. High order zeros will never appear on the report page; the omission of this card will cause the first report page to be numbered 1.

11-3. BODYLINES CARD:

BODYLINES XXX XX (columns 73-74)
(Report/Request No.
if SOURCE RETRIEVAL)

The total number of lines to appear between the last header and first trailer on each report page is indicated in this card. The bodylines will be the value found on the format card in the RIT if this control card is omitted.

11-4. COPIES CARD:

COPIES X XX (columns 73-74)
(Report/Request No.
if SOURCE RETRIEVAL)

This card specified the number of copies requested for each report output, with a maximum of 9. The short reports are more adaptable to the use of the copies card as report repetitions must occur. One copy is produced if this card does not appear.

11-5. CLASSIFICATION CARD:

CLASS UNCLASSIFIED (cols. 7-36) XX (columns 73-74)
(Report/Request No.
if SOURCE RETRIEVAL)

The classification for a report may be given on this card in any form utilizing a maximum of 30 positions beginning in column 7.

11-6. *COMMENTS CARD:

*(column 1) 2-70 available for comments XX (columns 73-74)
(Report/Request
if SOURCE RETR

An asterisk (*) in column 1 will cause the card to be printed. These cards may appear at any point in the control packet and an unlimited nu may occur together.

11-7. OFFLINE CARD:

OFFLINE PRINT XXXX	XX	
OFFLINE PUNCH XXXX	XX	Report/Request No. in columns 73-74 if SOURCE RETRIEVAL
OFFLINE PRINT, PUNCH, XXXX	XX	
OFFLINE PUNCH, PRINT, XXXX	XX	

The option for creating the output of the report on tape in either the print line or punched card image or both is specified by this card. Th XXXX indicates a blocking factor for the offline tape. The specificati the number of characters per block on the output tape is optional; it w be the last operand on the card, indicated by four digits if it is incl If the blocking factor is not given, it will be assumed to be 142 chara per block.

11-8. DATE CARD:

DATE XX_____XX (columns 6-16) XX (columns 73-74)
(Report/Request No.
if SOURCE RETRIEVAL)

This card supplies a specific date for a report to the system. The omi of this card will result in the use of the date the job is run. Any fo may be used to specify the date in card columns 6 through 16.

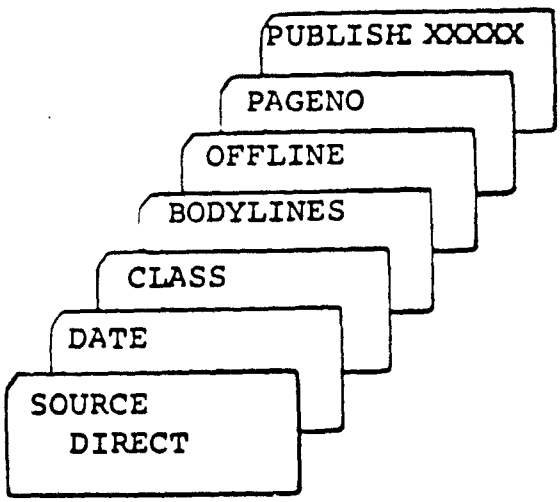
11-9. CREATE CARD:

CREATE XXXXR (RITID)

This card is primarily a report structuring card, and output supervisor recognizes each occurrence of the card and passes control to RS in the library update mode. A RIT is created and is assigned the identity spe fied in the operand of the create card. The ID (Identification) is fiv characters in length and ends with an R. Report structuring cards must immediately follow a create card. A series of create cards, each follo by report specification cards, may be stacked as one job.

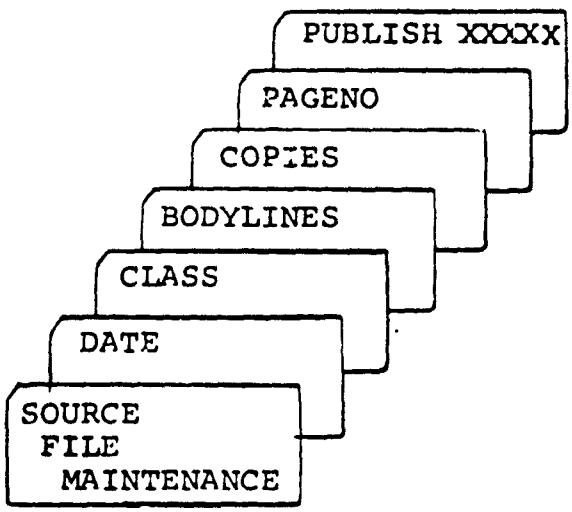
11-10. SEQUENCING OF OUTPUT CONTROL CARDS: The following discussion s several types of reports and the proper sequencing of the cards. For a review of the purpose of each card, refer to the beginning of this sect

a. Source Direct.



The above example will produce an output from the file directly. It will be recorded on an offline tape. The RITID specified in the publish card will determine the file, the format, which fields of the file, and other specifications as set up during report structuring. The publish card must appear last in the packet.

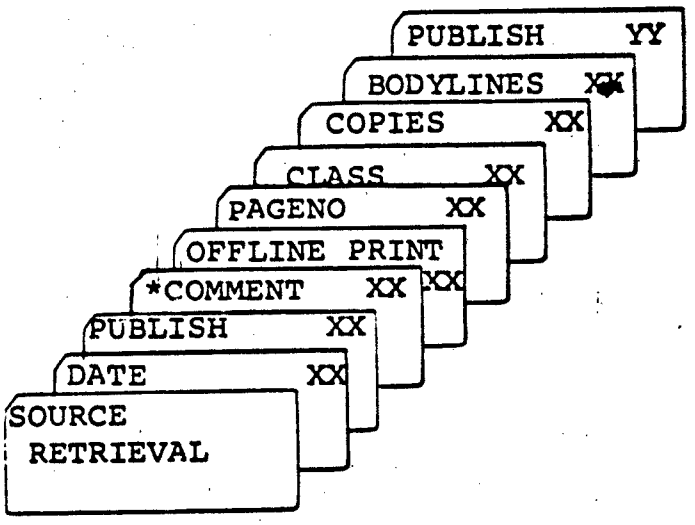
b. Source File Maintenance.



This example will select the file maintenance transaction tape and will produce it according to the RIT specified in the publish card. Note

that the publish card must be last but that the other control cards after the source card may be in any order.

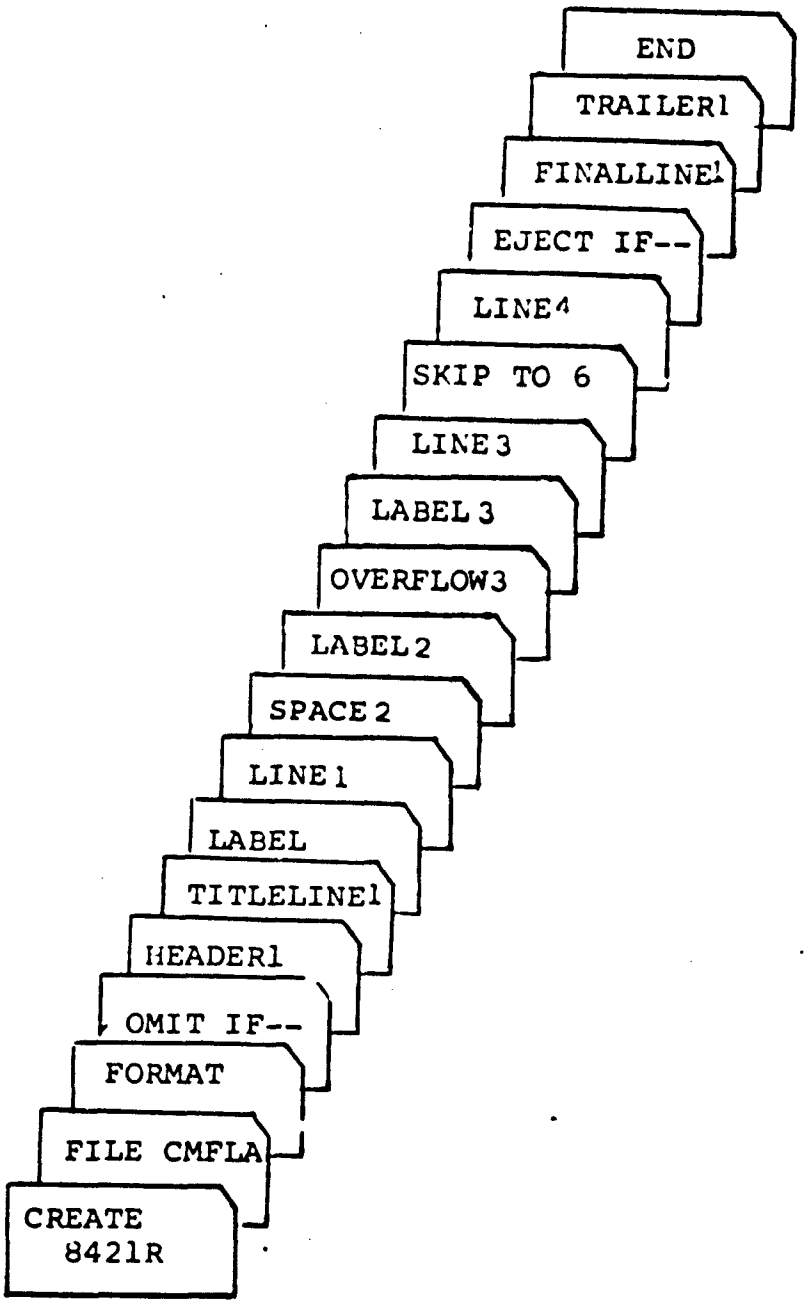
c. Source Retrieval.



This example demonstrates the control cards necessary for producing an output of the selected answer sets from the retrieval answer tape. After the source card, no particular order is necessary except that each report request must be together, and the numbers must be in ascending sequence. Columns 73-74 will associate the control cards with one answer set. Only the selected answer set will be produced. Similar control cards must be used for the other answer sets. Since only one source card is required for any number of control packets, there is no report/request number required in columns 73-74 of the card. The second publish card with a different report/request number indicates a new answer set is selected.

NOTE: The offline card specified "PRINT." This means that if printing is specified in the RIT format, the data to be printed will be recorded on offline tape; however, if the RIT format called for any data to be punched, it would be punched in cards and not recorded on the offline tape. If both print and punch data were to be on offline tape, the card should read "OFFLINE, PRINT, PUNCH, XXXX, XX".

d. Create. The following example demonstrates how a RIT is generated with the use of a create card. Report structuring cards must follow the create card. The name on the create card becomes the RITID (Report Instruction Table Identifier) and the RIT must be placed in the FFS Relocatable Execution Library for future use.



Create Run Report Instruction Table

11-11. REVIEW - OUTPUT SUPERVISOR CONTROL CARDS:

a. A source card is mandatory for all output functions except for a report structuring run.

b. Four sources are inputs to the output program:

SOURCE DIRECT
SOURCE FILE MAINTENANCE
SOURCE OFFLINE
SOURCE RETRIEVAL

c. Publish cards are used to specify the RIT or indicate that special RIT cards are following.

d. If the source is offline worktape, only the source card is necessary.

e. If the source is a retrieval answer tape, the following output may be specified:

(1) All answer sets using RIT specified in the report/request.

(2) Selected answer set using RIT specified in the report/request

(3) Selected answer sets using a different RIT than the one specified on the report/request.

(4) Selected answer sets using a special RIT made up of specification cards supplied at run time.

(5) Overriding the RIT's of selected answer sets and outputting all of the other answer sets using the RIT specified in the report/request.

f. Control cards that are used to provide data for system labels are:

CLASSIFICATION card
DATE card
PAGENO card
BODYLINES card

g. The number of copies for a report may be indicated.

h. The create card when used with report specification cards will create an RIT for updating the FFS Relocatable Execution Library.

APPENDIX A

GLOSSARY OF TERMS

ACTION STATEMENT	A statement entered on a specification card to specify that a particular operation take place. Operations may be MOVE, TOTAL, COUNT, or computations.
ALPHA	Information defined as being alphanumeric, that is, a field or literal which may contain alphabetic or numeric characters.
ANSWER RECORD	(See Answers)
ANSWER SET	A group of records on the retrieval answer tape that are the result of one retrieval request or report.
ANSWERS	Data records which have satisfied the logic condition(s).
BLOCK COUNT	The first four characters of each block of records on a tape, indicating the number of characters in the block.
BLOCKS	Physical tape records, separated by inter-record gaps, that contain one or more logical data records.
BODY LINES	The group of lines of a printed report that are between the last header line and the first trailer line.
COLLATING SEQUENCE	A sequence of characters arranged in the order of their relative rank.
CONDITIONAL ACTIONS	An action performed upon a result area if the condition placed upon the conditional field is satisfied.
CONDITIONAL FIELD	A field in the data record which may trigger a particular action.
CONDITIONAL STATEMENT	A statement that indicates a particular action can be performed if the condition is satisfied.
DATA	Information contained in a data file.
DATA FILES	A set of related data records.
DATA LINES	Lines that contain file data.

DATA RECORD	A unit containing a collection of related information.
DATA VALUE	The value supplied with which a field or group in the data record is tested.
EDIT	Use of the IBM 1410 editing capability to insert characters, remove leading zeros, etc. to make printed data more readable.
EJECT	A format control operation which causes carriage control on printer to skip to a new page. Trailers will be printed on the old page and headers on the new page.
FIELD	The basic unit of information in a data record.
FIELD NAME	The synonym or mnemonic assigned to represent a discrete area (field or group) in the data record.
FILE MNEMONIC	A five-character abbreviated name assigned to a data file.
FILE NUMERIC	A two-character numeric value assigned to a data file for identification in Retrieval.
FINAL LINES	A line or group of lines that will be put out only at the conclusion of a report. It is normally used for obtaining summary data.
FIXED FIELD	The basic unit of information in the fixed section of the data record.
FIXED GROUP	A combination of fixed fields.
FIXED SET	A collection of all fixed fields and groups.
GEOGRAPHIC OPERATOR	A retrieval logic operator which is used to determine if a value in the data record representing an area of the earth overlaps a specific polygon representing a user's area of interest.
GROUP	A combination of fields.
HEADERS	A line or group of lines which appear at the top of each page and only at the top.

HORIZONTAL PERIODIC SUBSETS	The method of printing periodic subsets n per line, where n times the number of characters printed from a subset plus spacing is less than 132.
INTER LOGIC	A mode of logic assigned to periodic sets requiring that each term against the periodic set need only be satisfied by at least one subset.
INTRA LOGIC	A mode of logic assigned to periodic sets requiring that all terms against that periodic set be satisfied in the same subset.
KEY WORD	In the retrieval language, a retrieval operator word which is essential to the meaning of a retrieval statement.
LABELS	A horizontal line of field identifiers. Field identifiers may not be in a data line unless entered as a literal in a data line.
LITERAL	Any group of characters, desired to be output, that are not part of the data records.
LOGIC CONNECTOR	An "AND" or "OR" condition used to combine logic terms.
LOGIC EXPRESSION	A group of one or more terms.
MERGE	In retrieval, the combining of data files.
MNEMONICS	A five-character abbreviated name used to identify a discrete area in the data record.
MODE	(See Scan, Non-Scan, Terminate Modes.)
MULTI-FILE REPORTS	A report whose data come from more than one file. Such a report can only be produced via a retrieval run.
NATURAL FILE ORDER	The arrangement or order of the data records in their file. This information is found in the data files File Specification Sheet - Retrieval. (See subparagraph 2-6.a.)
NOISE WORDS	Optional words that are used to clarify an expression.
NON-SCAN MODE	A variation of INTRA logic which does not indicate those subsets which satisfy the logic terms.

NUMERIC	Information defined as being numeric, that is, a field or literal which must always contain numeric characters.
OFFLINE TAPE	A tape produced by the output program containing print line and/or card images for listing and/or punching by the output program at a later time.
OMIT	The conditional exclusion of data records from a report or a format of a report.
ORDER	In retrieval the establishment of a desired sequence in a data file.
OVERFLOW	Lines which are printed after headers on pages which continue data from a record started on a previous page.
PAD	(See Padding.)
PADDING	The process of adding characters to a word or number to increase the size to a correct value. In retrieval, numeric data is padded with zeros on the left; alpha data is padded with blanks on the right.
PERIODIC FIELD	The basic unit of information in the periodic section of the data record.
PERIODIC GROUP	Combination of periodic fields.
PERIODIC MODE	A selective means of outputting periodic sets. Either all subsets, all flagged subsets (from retrieval), the first n subsets, or the last n subsets may be listed; n = number.
PERIODIC SECTION	Collection of periodic sets
PERIODIC SET	A collection of periodic subsets having the same format and information type.
PERIODIC SUBSET	The combination of periodic fields and groups having a physical or logical relationship.
QUERIES	The component questions of a report.

QUERY NUMBER or SEARCH NUMBER	A four-character field allowing unique identification of queries.
RECORD	A logical data group on a tape, separated from other groups by a record mark.
RECORD ID GROUP	A field or group of fields which uniquely identify each data record.
RELATIONAL OPERATOR	A collection of words that express a relationship between two items, e.g., A is less than B.
REPORT	Single or multiple questions against one or more data files.
REPORT HEADER CARD	The first card of a report.
REPORT NUMBER	The ID assigned to a report.
REQUEST	A single question against a single data file.
REQUEST NUMBER	The ID assigned to a request.
RESULT AREA	The area into which a total, count, long form compute, or move is placed. A result area must be a named literal, and may or may not be previously defined.
RETRIEVAL RUN	One or more requests and/or reports entered into the system at one time.
RIT	A program, called a report instruction table, which will produce a report, when executed, in the required format.
RITID	A five-character name ending in an R which will uniquely identify a report instruction table.
SCAN MODE	A variation of INTRA logic which indicates the subsets satisfying the logic.
SEARCH NUMBER	Generally this number identifies one question directed against a file. Specifically, when referencing reports, the search number is the same as the query number. When referencing requests, the number is the same as request number.

SKIP TO n	A format control operation which causes the carriage control on the printer to skip to the channel specified in the skip to card. It is only applicable to printed output.
SORT KEY	A group of characters containing both data and identification numbers which is used to arrange an answer tape in a desired order.
SOURCE	A means of identifying to the output program what the input to the output program is and where control information can be found.
SPECIAL REPORT	A document which has no report instruction table. The output program creates a RIT at run time. (This should apply only to one-time documents.)
STANDARD REPORT	A document whose report instruction table has been structured and is stored in the FFS Relocatable Execution Library.
STANDING QUERY FILE	The maintenance of reports and requests in a card or tape medium for rapid access.
STATEMENT	An expression which is meaningful to the retrieval or output program.
STOP	Termination of a report upon satisfaction of a conditional statement.
SUBROUTINE	The term used for the input output conversion programs referenced by output and other system programs. It is used to convert data to a more usable form.
SUMMARY REPORTS	Summary information on the entire report or portions of the report. This could be in the form of counts, totals, or results of computations.
SYNONYM	A word or collection of words used to reference a discrete area in the data file. If more than one word, a synonym used in output must use hyphens (not blanks) between words. (See FIELD NAME)
SYSTEM LABELS	Literal names which are permanently defined in the output program and refer to constants or counters used by the program.
TABLE	A conversion routine which is used in the same manner as a "SUBROUTINE."

TERM	A single logic statement.
TERMINATE MODE	A variation of INTRA logic closely akin to the scan mode. Its main use is to reduce computer running time.
TITLELINE	A line or group of lines which appear only at the top of the first page of a report.
TRAILER	A line or group of lines which appear at the bottom of each page, and only at the bottom.
TRUNCATION	The process of dropping one or more characters without altering any remaining characters.
VARIABLE SET	Free format area of the data record.
VERTICAL PERIODIC SUBSETS	The method of printing periodic subsets, one per line, and repeating the line until all required subsets are printed.

APPENDIX B

THE RETRIEVAL GUIDE

Appendix B is designed to outline the steps an analyst must follow in formatting retrieval requirements. This appendix will not obviate a firm knowledge of the body of this manual.

ANALYSIS SECTION

1. Analyze the problem ascertaining:

   A. The data file(s) containing information of interest.

   B. How the required information can be uniquely defined.

   C. The order or arrangement desired for the answers.

   D. The output format desired for the answers.

SELECT FORMAT

2. If more than one data file is required, go to 13 (Report Format).

3. If more than one question must be employed to state the requirement, go to 13 (Report Format).

4. If the natural order of the data file (reference - File Specification Sheet - Retrieval for the data file's natural order) is sufficient, go to 7 (Request Format).

5. If the ordering required for the answer records can be related to information in the data record, go to 7 (Request Format).

6. Go to 13 (Report Format).

REQUEST FORMAT

The request format can be employed for a single question against a single data file. The answers from the request can be ordered only on information in the data records (if an order other than the natural data file order is required).

7. Complete the identification section of a request form. The file mnemonic and file numeric will be found on the File Specification Sheet - Retrieval for the file. (Reference "Request Format, Identification Section, section five, subparagraph 5-1.b.(1).)

8. Complete the request card. (Reference "Request Card, section five, subparagraph 5-1.b.(2)(a).)

A. Complete the date entry and supply additional comments that will functionally identify the request.

9. Any comments desired for the request will follow the request card. These comments will be printed prior to the answers for the request. Comment cards start with an asterisk in column one. Any number of comment cards may be present. (Reference "Comments Card," section five, subparagraph 5-1.b.(2)(b).)

10. Go to 25 (Logic) and return.

11. If ordering or arranging is required, go to 31 (Sort Card) and return.

12. The request is completed. Submit the request (together with any other retrieval requirements) with the Retrieval Specification Sheet illustrated in figure 5-33.

REPORT FORMAT

It is not advisable to attempt the use of the report format without a firm knowledge of the ordering and merging techniques covered in Section Six, "Data Arrangement." This outline for using the report format will employ terminology explained in that section.

13. Complete the identification section of the report header form. (Reference "Report Header Form - Identification Section." section five, subparagraph 5-2.b.(1).)

14. Complete the report header card. Perform step 8A.

15. Any comments desired for the report will follow the report header card. The comment will be printed prior to the answers for the report. Any number of comment cards are allowed, each starting with an asterisk in column one. (Reference "Comments Card," section five, subparagraph 5-1.b.(2)(b).)

16. Complete the inquiring card. The inquiring card specifies the order in which the data files will appear on the printed page, or the order the files will appear within a physical or logical group of answers. A maximum of ten data file mnemonics may appear on the inquiring card. (Reference "Inquiring Card," section five, subparagraph 5-2.b.(2)(c).)

UERY FORMAT

he number and organization of the queries for a report can come only hrough an understanding of Section Six, "Data Arrangement."

17. Complete the identification of the query form or forms. (Reference "Query Form - Identification Section," section five, subparagraph

5-2.c.(1). The use of the query number is covered in detail in section six, subparagraph 6-2.c.

18. The query header card is complete as it exists on the query form. Any additional comments may be placed on this card. (Reference Query Card, section five, subparagraph 5-2.c.(2)(a).

19. No comments lines are allowed on the query form.

20. Go to 25 (Logic) and return.

21. It is important to note that if an "override" card were required from the logic section, the override condition would pertain to all queries of the report directed against the same data file as well as the query containing the override card. The override card, if present, may be carried only in the first query of the report against each data file.

22. If ordering or merging is required in addition to that provided by the use of the query number, go to 31 (Sort Card) and return.

23. If the Sort Card was employed, it is important to note that the Sort Card may be carried in only the first query of the report against each data file. All answers to subsequent queries (against the same data file as the query with the sort card), will be sorted in accordance with the sort information carried in the first query.

24. The report is completed. Submit the report and query forms (together with any other retrieval requirement) with the Retrieval Specifications Sheet illustrated in figure 5-33.

LOGIC

25. Determine the location in the data record of each item of information (fixed, periodic, or variable section). This will be shown graphically on the graphic layout sheet. If the information is in the variable section of the data record, it cannot be employed for retrieval.

26. Information in the fixed section of the data record will not exert any influence on the logic conditions directed against it.

27. Logic conditions directed against periodic information will be processed according to the mode of logic assigned to the periodic set. The logic mode of each periodic set is stated in the detail description for each data file.

    A. INTRA mode - When this mode is indicated for a periodic set, all consecutive logic terms directed against the periodic set must be satisfied in the same periodic subset.

B. INTER mode - The INTER mode specifies that all logic terms directed against a periodic set may each be satisfied in any periodic subset.

C. Consecutive terms directed against a periodic set in the INTRA mode may be "broken" or interrupted by use of a period after a logic term. The period will "terminate" a consecutive sequence. (Reference "Interrupting the Mode," section four, subparagraph 4-3.b.)

D. If another logic mode is desired for a periodic set other than the mode assigned, the mode can be altered with an override card. (Reference "Override Card," section five, subparagraph 5-2.c.(2)(d).)

E. For more comprehensive information on the effects of the logic modes of periodic sets, reference Section Four, "The Development of Logic."

28. Knowing the effects of the information organization on the logic, the logic terms are constructed following the examples given under "Logic Cards," section five, subparagraph 5-1.b(2)(c).

29. Any number of logic terms may be grouped to fashion the complete question.

30. Return.

SORT CARD

31. The Sort Card may be used to specify what information is to be used to produce the desired order of the answer records (section five, subparagraph 5-1.b.(2)(d)).

32. The sort card is completed in accordance with the information found under "Sort Card," section five.

33. If request, return to 11.

34. The sort card may be used to relocate the file sequence number to effect a merge of data files on information contained in the files. (Reference section six, figure 6-8.)

35. The rules for using the file sequence number to merge files will be found in the last paragraph of Ordering and Data Merge - Multiple Files, section six, subparagraph 6-7.d.

36. Return to 23.

APPENDIX C

RETRIEVAL ERROR REFERENCE SHEET

In processing retrieval requirements, retrieval verifies the integrity of the input format and logic. On detecting an error, retrieval gives the following information.

A statement of error.

Last ten characters of card in error (or enough of these characters to identify the error).

The following list includes all retrieval error statements with the possible causes of each error.

CARD HAS ILLEGAL FORMAT

Card format incorrect.

COMMENT CARDS OUT OF SEQUENCE

The comment cards are not in the sequence specified in section five, figures 5-8, 5-13, and 5-21.

CONCAVE POLYGON

The figure defined for a polygon search is concave.

CONTROL INFORMATION NOT ALLOWED

Control information (sort-override) is found in other than the first query of a report.

COORDINATE DATA INCORRECT

More than eight points have been specified for one operator.

Comma missing on a coordinate card.

CROSS-INDEX XXXXX NOT FOUND IN DISK DIRECTORY

A required cross-index cannot be found.

DATA TOO LARGE

The data field on a logic card is larger than the edit mask required to process it.

DUPLICATE REPORT/REQUEST NUMBERS

Two groups contain the same number in columns 73-74.

DUPLICATE SEARCH NUMBERS

Two requests/queries contain the same number in card columns 75-78.

ERR - 01 FILE XXXXX

A file ntry appears in the file address table (FAT) but both the serial and logical search switches are off.

ERR - 02 FILE XXXXX

There are logical searches against the current file (the logical search switch in the FAT is on) but an access number list cannot be found.

ERR - 03 FILE XXXXX

The file data table for the file cannot be found.

ERR - 04 FILE XXXXX

The access number list is out of sequence.

ERR - 05 FILE XXXXX

Disk file XXXXX is indicated and there are no serial searches against it or there are logical searches against it.

ERR - 06 FILE XXXXX

The data file or the access number list is out of sequence.

FIELD FOUND IN SYNTAB NOT IN FFT

A field found in a synonym table for a file cannot be found in that file's FFT.

INCORRECT DATA

Comma missing after last data field on a logic card.

A data field occupies columns 69 or 70 of a logic card.

A data field submitted to a subroutine for conversion is incorrect.

INCORRECT FIELD NAME

A field mnemonic or synonym is spelled incorrectly.

INCORRECT FORMAT

Column 70 of a logic card is not blank.

More than nine field names on a logic card.

More than nine data fields on a logic card.

Card type does not begin in the correct column.

INCORRECT FORMAT FIRST LOGIC CONNECTOR

The first logic connector of a logic statement is an "OR".

INCORRECT LOGIC CONNECTOR

Columns 1-54 of a card following a logic card containing coordinate data are blank.

INQUIRING CARD ABSENT OR INCORRECT

The inquiring card required by a report is absent.

The file numeric or report number is incorrect.

LLSA XXXXXX NOT FOUND

A required list of logical search arguments cannot be found.

LOGIC TABLES FILLED, THIS SEARCH AND ALL SUBSEQUENT SEARCHES

The logic tables are full. No more searches can be accommodated.

MORE THAN ONE SORT/OVE CARD

More than one sort or override card is entered with a single request or query.

MORE THAN 2 ELIMINATION ENTRIES THIS SEARCH

One request/query may contain only two references to a field designated as a files elimination field.

MORE THAN 3 CROSS-INDEX ENTRIES THIS SEARCH

A cross-indexed field may be referenced only three times in one report/request.

MORE THAN 20 FILES IN RUN

Self-explanatory.

MORE THAN 34 GROUPS IN ERROR

Self-explanatory.

MORE THAN 100 SEARCHES

Self- xplanatory.

MULTIPLE FIELD NAMES AND DATA FIELDS

Multiple fields and data are entered on one logic card.

NO FILE CARD - FILE IS PASSED

File card is absent.

NO FILES TO BE PROCESSED IN FILE ADDRESS TABLE

This message is produced by the cross-index processor when it is entered incorrectly.

NO HEADER CARD

A report, request, or query header card is absent.

NO LOGIC CARDS

Request or query is submitted without logic cards.

NO MORE DISK TRACKS AVAILABLE FOR ANL

The temporary disk area is not large enough to accommodate the access number list.

OPERATOR GROUP INCORRECT

Invalid relational operator.

OPERATOR MISSING

A logic operator cannot be found on a logic card.

PERATOR MISSPELLED

A relational operator word is spelled incorrectly.

VERRIDE CARD INCORRECT

The override card contains more than three entries.

The override card is blank.

VERRIDE LIMITATION EXCEEDED

In any one retrieval run only eight override cards may be submitted.

REPORT/FILE LIMITATION EXCEEDED

No more than five reports may query the same file.

REPORT GROUP XX APPEARS AFTER FILE CARD OR ID NOT Ø

A report group appears after the first file card is read.

A report card does not contain ØØ in columns 71-72.

RET CTL CD ABSENT OR INCORR

The retrieval control card is absent or formatted incorrectly.

RETRIEVAL RUN SCRAPPED NNNNN

The retrieval run has been scrapped. A message is printed on the console or on the 1403 explaining the reason. "NNNNN" contains the address of the B-Address Register at the point the error message was typed.

RIGHT PAREN, NO LEFT PAREN

A right paren is sensed and previous parens have not been matched.

SEARCH POLYGON CROSSES 180th MERIDIAN

The coordinate points specified on a logic card (cards) outline an area that crosses the 180th meridian.

SORT FIELD INCORRECT

Field specified on a sort card is incorrect.

SORTING ON MORE THAN 1 PERIODIC SET

More than one periodic field has been specified on a sort card.

SORTING ON PERIODIC FIELD, NOT IN SCAN MODE

A field specified on a sort card references a periodic set which is not assigned the scan mode.

SORTING ON VARIABLE FIELD

Attempting to sort on variable field.

SUCCESSIVE/AND/CONNECTORS WITH SAME OPERATOR AGAINST FIXED FIELD

Two successive terms directed against the same fixed field have "AND" connectors and have the same relational operators (other than Not Equal).

SUCCESS[illegible]D/CONNECTORS WITH SAME OPERATOR AGAINST SAME PERIODIC SET, INTRA MODE

Two successive terms with "AND" connectors are directed against a periodic set in INTRA Mode and have the same relational operator.

TOO MANY ACCESS NUMBERS

Logic cards contain an unusually large number of logic terms employing data record access numbers.

TOO MANY LOGIC CARDS

A temporary logic table has been exceeded because an unusually large number of logic cards have been entered for one request or query.

VARIABLE FIELD

Attempting to retrieve on a variable field.

XXXXX CARD IS INVALID OR OUT OF SEQUENCE

PS control cards are either punched incorrectly or placed in the wrong sequence.

FFT XXXXX NOT FOUND

The above FFT cannot be located within the system.

SORT KEY LIMIT HAS BEEN EXCEEDED

The sort key limit of 25 characters has been exceeded.

[illegible] THAN ONE PERIODIC SET HAS BEEN SPECIFIED

Sort control card has specified a sort on more than the maximum of one periodic set.

FIELD XXXXX NOT IN FFT

The field specified in the sort control card cannot be located in the desired FFT.

MORE THAN ONE FILE CARD FOR NONRETRIEVAL INPUT

More than the maximum of one file card has been placed in the PS control card deck for a nonretrieval run.

UNCORRECTABLE ERROR

Represents any error other than the above mentioned conditions.

FIELD CANNOT BE IDENTIFIED

This will result from any request after the first one when an attempt is made to batch requests.

APPENDIX D

OUTPUT ERROR MESSAGES

Report specification cards are checked for errors as they are processed. In most cases, if an error is detected, an attempt will be made to check the rest of the card. In some cases assumptions are made and an attempt is made to process the erroneous specification.

ERROR LISTING

The list of errors detected during the run is printed after all the specification cards are printed. Each error references the sequence number of the card on which the error occurred. In case of an out-of-sequence card or a blank sequence number, a 3-digit sequence number suffixed with "S" will be generated by the program and printed with the card.

EXCESSIVE ERRORS

In the case of a very large number of errors, all the report specification cards will not be processed and the message:

RUN TERMINATED DUE TO EXCESSIVE ERRORS

will be printed. The remaining cards will be printed without checking and errors detected for the first group will then be printed. Provision is made to process approximately 50 to 100 errors before this condition results. (The exact number depends on the amount of data associated with each error.)

ERROR SEVERITY

Each error message printed is accompanied by a three-digit number which serves as a reference to the error explanations in this section. The first digit of the number indicates the probable severity of the error. Error severity is defined as follows for the four levels:

1. Possible error. A good chance exists to produce a correct report.

2. Probable error. Some chance exists to produce a correct report.

3. Definite error. A correct report cannot be produced; however, for checkout purposes, some advantage may be gained by producing the report.

4. Terminating error. Even an incorrect report cannot be produced.

The output program will check the maximum error severity during a run and proceed or stop, depending on this value. Processing will be terminated on a run for library update (CREATE, specification) if an error is encountered with a severity greater than 1. A special report will be terminated on an error severity greater than 3. If termination occurs, the message will be printed.

ERROR SEVERITY EXCEEDED - RUN TERMINATED

OTHER ERRORS

In addition to the errors which reference a particular card, other errors may be detected during later processing. These are printed without card sequence or an error reference number and are as follows:

ALL SUBROUTINES WILL NOT FIT INTO CORE. NNNNN NEEDED.

This is of an advisory nature. The RIT can be processed, but the run will proceed slowly because of constant overlaying of subroutines.

LARGEST SUBROUTINE WILL NOT FIT INTO CORE.

RIT TERMINATED. NNNNN NEEDED

A single subroutine will not fit into core. The report will not be processed.

RIT WILL NOT FIT INTO CORE. RIT TERMINATED. NNNNN NEEDED.

Space is not available in the computer to process the report. NNNNN in the above messages indicates the amount of storage required to rectify the situation.

SECTION REFERENCE

Included with most of the error messages on the following pages, will be a reference to a section or an appendix. This will indicate the section where the proper procedures are discussed.

OUTPUT ERROR MESSAGES

REPORT STRUCTURING		SECTION
103	COMPUTE STATEMENT MUST HAVE EQ OR = Will attempt to process	10
104	PARAMETER MISSPELLED, AM ASSUMING The parameter is assumed to be the one printed with the message and processing is continued.	8
105	MISSING PARAMETER, AM ASSUMING The printed parameter is assumed and processing is continued.	
106	BOTH FIELDS OF COMPARE NOT OF SAME TYPE. ALPHABETIC COMPARED USED One operand of a compare is alphabetic while the other is numeric. A 1410 collating sequence compare will be used.	8

REPORT	STRUCTURING	SECTION
107	OPERAND MISSING ON THIS CARD - CARD DELETED	
108	OF MISSING FROM TOTAL OR COUNT STATEMENT -- PROCESSING CONTINUED Statement should be TOTAL OF ___ ___or COUNT OF _____. Check for possible error.	9
111	MULTI-FILE ASSUMED A multifile report has been specified and may be run only from a retrieval answer tape.	E
117	NO DATA PROCESSED IN PREVIOUS FORMAT A new format has been encountered before any processing has been done on a previous FORMAT card.	9
118	FORMAT PARAMETER GREATER THAN MAXIMUM - STANDARD USED See the discussion of FORMAT cards for values of standard and maximum parameters.	9
123	LITERAL PREVIOUSLY DEFINED. PREVIOUS DEFINITION ELIMINATED A literal name has been defined twice. The new definition will be used in future references.	10
137	CONDITIONAL FIELDS OVERLAP. BOTH WILL BE PROCESSED The output positions of two conditional fields or expressions overlap. A definite error will result if the conditional statements are not mutually exclusive.	9
202	CARD TYPE MISSPELLED, ASSUMING The printed card type has been used for the card and the card processed.	
204	THREE CONTINUATION CARDS EXCEEDED - FOURTH PROCESSED AS NEW CARD	8
205	CONTINUATION CARDS NOT OF SAME TYPE - PROCESSED AS SEPARATE CARDS The card type in a continued card must be exactly the same as the card from which it was continued.	8
206	FILE NAME DOES NOT END IN A OR H - PROCESSING ATTEMPTED WITH FIRST FOUR CHARACTERS	9

207	FILE FORMAT TABLE NOT ON SYSTEM LIBRARY. If spelling is correct, consult the file monitor.	
208	2 OR MORE FILE CARDS WITH NO FORMAT CARD. THIS FILE WILL NOT BE USED.	
209	SECOND FILE CARD. PREV FILE INCOMPLETE. FIRST FILE RETAINED A second FILE card has been encountered before any data has been processed in the first FILE card.	9
212	MULTIPLY DEFINED NAMES. LITERAL WILL BE USED. A literal name and a field, group, or synonym name are identical. Processing will be done with the literal.	9
214	SECOND SPECIFICATION FOR PERIODIC MODE - REPLACING FIRST WITH SECOND The periodic mode specification has been made twice on a line, card, or record for the same set.	9
215	FOLLOWING CANNOT BE IDENTIFIED - PROCESSING CONTINUED	
216	TWO OR MORE FORMAT CARDS OF SAME TYPE - FIRST ACCEPTED	8
218	SPACE BETWEEN RECORDS NOT PRECEDED BY LINE SPECS The _____ BETWEEN RECORDS, card must be after all LINE and LABEL specifications for the report.	9
219	THIS OUTPUT TERM NOT ALLOWED HERE	
220	NO FORMAT CARD - USING STANDARD PRINT PARAMETERS	8
221	NUMERIC LEVEL OF CARD DECREASES. LEVEL RESET TO THE VALUE ON THIS CARD Check label or line level number.	9
222	ALPHABETIC LEVEL OF CARD DECREASES. LEVEL RESET TO VALUE ON THIS CARD. Check label or line level number.	9
223	SEQUENCE ERROR BETWEEN THIS CARD AND PREVIOUS LINE CARD Numeric or alphabetic level must increase from LINE to LABEL. Card will be processed as new level.	9

REPORT STRUCTURING		SECTION
224	TRAILER, FINALLINE OR --- HAS PRECEDED LINE OR LABEL. WILL BE PROCESSED	8,9
225	ATTEMPTING TO LABEL AN AT SIGNED LITERAL IN EXTRACT The label will not be processed	11
226	BLOCK SIZE SMALLER THAN RECORD SIZE - AM ADJUSTING TO Tape block size must be at least 4 characters larger than the record size.	9
227	ILLEGAL PARAMETER AFTER - BETWEEN - RECORDS ASSUMED	9
228	ALPHABETIC FIELD IN COMPUTE STATEMENT - WILL ATTEMPT TO PROCESS	9
237	ILLEGAL PARTIAL FIELD NOTATION - WILL BE IGNORED	9
238	PARTIAL FIELD SPECIFICATION EXCEEDS FIELD LENGTH - CARD DELETED	9
239	SUBROUTINE NAME NOT SPECIFIED	9
240	INCORRECT SUBROUTINE NAME - USING FFT SUBROUTINE Subroutine names must be 5 characters in length and end with "S".	9
241	NO FORMAT CARD - USING STANDARD PUNCH PARAMETERS	8
242	NO FORMAT CARD - USING STANDARD RECORD PARAMETERS	8
243	FIELDS OF CONDITIONAL STATEMENT NOT OF SAME LENGTH - IGNORING CONDITIONAL	8
244	PERIODIC SET IS NOT CONSISTENT IN THIS EXPRESSION Expression will be processed. Will result in errors if sets have a different number of subsets in <u>any</u> file record.	9
245	CARD MUST HAVE NUMERIC LEVEL - LEVEL RESET TO ZERO	9

REPORT STRUCTURING		SECTION
246	CANNOT IDENTIFY CARD TYPE FOLLOWING - BEFORE Parameter following BEFORE must be exactly the same as the next card type.	9
247	TWO FIELDS IN MOVE STATEMENT UNEQUAL - WILL PROCESS Can result in loss of high order characters or unknown characters in high order of second field.	9
248	TRAILERS NOT ALLOWED WITH EXTRACT UNLESS HEADERS ARE SPECIFIED. CARD DELETED.	11
249	FIELD MUST BE NUMERIC	8,9
301	FIELD MUST BE VARIABLE Card deleted.	9
302	UNDEFINED VARIABLE FIELD Card deleted.	9
306	CARD TYPE OUT OF SEQUENCE See section on card sequencing. Card will be processed.	E
307	SECOND FIELD OF CONDITIONAL INVALID Not an allowable conditional operand. This conditional statement is not processed.	8
309	LITERAL EXCEEDS MAXIMUM. Maximum literal or label size is 52 characters.	8
312	MULTI-FUNCTION SYNONYM REFERENCE - CANNOT BE USED IN OUTPUT Multifunction references are used by retrieval only. Name will be considered undefined.	
313	SPACE, SKIP, OR EJECT STATEMENT NOT ALLOWED HERE - CARD DELETED	E
315	FIELD TO BE EDITED EXCEEDS EDITING CAPACITY OF EDIT WORD Edit will not be processed.	9
316	CONDITIONAL STATEMENTS MUST BE OF THE - IF COMPLETE - TYPE Other conditionals are not allowed in EXTRACT.	11

REPORT STRUCTURING		SECTION
317	UNDEFINED FIELD IN CONDITIONAL STATEMENT Statement will not be processed.	8
318	PERIOD ILLEGAL IN CONDITIONAL STATEMENT Conditional will not be processed.	8
320	NUMB OF OCCR FOR FIELD NOT CONSISTENT WITH REST OF SET - REDUCING NUMBER Number for this line will be set to number on this card.	9
321	NO MORE PUNCH SPECIFICATIONS ALLOWED Card deleted.	9,E
322	NO MORE RECORD SPECIFICATIONS ALLOWED Card deleted.	9,E
323	NO MORE PRINT SPECIFICATIONS ALLOWED Card deleted.	9,E
324	LITERAL ON DEFINE CARD NOT NAMED Define not processed.	9
325	PERIODIC SET ID NOT SPECIFIED, LITERAL ASSOCIATED WITH ANY SET	9
326	LITERAL INCORRECTLY SPECIFIED Card deleted.	8,9
327	LITERAL EXCEEDS 52 CHARACTERS Literal will not be processed.	8
328	SYNONYM TABLE EXCEEDS AVAILABLE CORE STORAGE - FIELD MNEMONIC MUST BE USED	
329	UNDEFINED FIELD	
330	NUMBER OF SUBSETS DESIRED NOT INDICATED Specification will be ignored.	9
331	NUMBER OF SUBSETS EXCEEDS MAXIMUM - ASSUMING ALL	9
332	NO END CARD - END CARD ASSUMED AT THIS POINT RIT will be terminated at this point with normal windup.	E

REPORT STRUCTURING		SECTION
333	PERIODIC SET ID NOT SPECIFIED - ASSUME FFT MODE	9
334	NUMERIC OR AT SIGNED LITERAL NOT ALLOWED HERE, CARD DELETED .	9
335	THIS MUST BE FILED OR NUMERIC LITERAL Card deleted.	9
336	PERIODIC SET ID EXCEEDS 9 Specification ignored.	9
337	FIELDS OVERLAP -- LAST FIELD REPLACED WITH* Check field size in File Specificatior. Check output size if edit, table, or subroutine used.	9
339	NUMB OF OCCR FOR FIELD NOT CONSISTENT WITH REST OF SET - SOME SUBSETS DELETED Some subsets will be left out if this RIT is executed.	9
340	NO LEGAL OPCODE IN CONDITIONAL STATEMENT Statement deleted.	8
341	LITERAL UNDEFINED	9
343	NO IDENTIFICATION FOR LABEL Label not processed.	11
344	ATTEMPTING A TOTAL OR COUNT OF AN UN-DEFINED FIELD - IGNORING OPERATION	9,11
347	PARTIAL FIELD NOTATION NOT ALLOWED HERE Full field used	11
348	LENGTH OF COMPUTATION RESULT EXCEEDS SYSTEM LIMIT Compute deleted.	9
349	OUTPUT TERM ILLEGAL - SHOULD BE VARIABLE FIELD Card deleted.	9
350	NUMBER OF SPACES DESIRED MISSING Card deleted. Check SPACE card description.	8

REPORT STRUCTURING		SECTION
351	NUMBER OF SPACES EXCEEDS MAXIMUM LINES PER PAGE Spacing ignored.	9
354	SKIP ILLEGAL TO CHANNEL Card deleted.	9
358	PERIODIC SET ID IS LESS THAN 1 Specification ignored.	9
359	DEFINE CARD SHOULD HAVE AN ALPHA FIELD AFTER CARD TYPE Card deleted.	9
360	AREA TO BE RESET IS UNDEFINED Card deleted.	9
361	AREA TO BE RESET IS A DATA FIELD Card deleted.	9
362	AREA TO BE RESET IS AN ALPHA LITERAL Card deleted.	9
363	ATTEMPTING TO RESET AN AREA WITH AN ALPHA FIELD Card will be processed.	9
364	ATTEMPTING TO RESET AN AREA WITH AN UNDEFINED LITERAL Card deleted.	9
365	CANNOT IDENTIFY CARD TYPE - CARD DELETED	
366	ALPHABETIC LITERAL IN COMPUTE STATEMENT Compute deleted.	9
367	COMPUTE STATEMENT EXCEEDS FIVE FACTORS	9
369	VARIABLE FIELD NOT ALLOWED HERE Will not be processed.	9
370	SET ID INCORRECT Specification ignored.	9
371	SUBROUTINE NOT ON LIBRARY - WILL RECHECK AT EXECUTION	9
372	NUMBER OF SUBROUTINES EXCEEDS SYSTEM LIMIT. FOLLOWING ROUTINE NOT PROCESSED Field or expression will be output unconverted.	

REPORT STRUCTURING		SECTION
373	FIELD SPECIFIED AFTER - IN - MUST BE LITERAL. "IN" is ignored.	9
374	TWO - SPACE BEFORE - CARDS WITH UNEQUAL VALUES, SECOND WILL OVERRIDE FIRST	9
375	TWO - SPACE BEFORE - CARDS, SECOND NOT CONDITIONAL. SECOND WILL OVERRIDE FIRST	9
376	CARD TYPE NOT THE SAME AS SHOWN ON PREVIOUS BEFORE STATEMENT. SECOND WILL OVERRIDE	9
377	DATA FIELD NOT ALLOWED ON THIS CARD TYPE Will be considered undefined.	
378	FIELD OVERFLOWS LEFT END OF OUTPUT AREA Card deleted. Print position did not allow for output size. Check File Specification for field, table, or output size from subroutine.	9
379	OUTPUT POSITION TOO LARGE, CARD DELETED	
380	EDIT WORD MISSING. FIELD WILL BE OUTPUT IN INTERNAL FORMAT	9
381	FIELD EXCEEDS EDIT WORD CAPACITY. FFT EDIT WORD WILL BE USED	9
382	EXTRACT MAY NOT BE USED WITH LINE OR LABEL. CARD DELETED	11
383	LITERAL TABLE FULL. NO MORE LITERALS WILL BE PROCESSED.	
419	NO FILE CARD - THIS CARD DELETED	9

OUTPUT SUPERVISOR		SECTION
...**	ILLEGAL O/P SUPERVISOR CONTROL CARD ** Generated if the first card in the input control card packet is neither a REMARKS, CREATE, nor a SOURCE card. Message follows card which it illustrates.	12

OUTPUT SUPERVISOR		SECTION
...**	RETRIEVAL SOURCE ASSUMED** Indication to user of assumption made if an end of file condition is met at the initial read.	12
...**	ERRONEOUS SOURCE CARD** Generated with card to which it refers. The comparison against the first three digits of the specified source has not found a matching condition to a valid source (DIRECT, FILE MAINTENANCE, OFFLINE, RETRIEVAL); the source cannot be processed.	12
...**	PUBLISH CARD MISSING**... Indication that the PUBLISH card, required in the input control card packets for DIRECT and FILE MAINTENANCE, has not been found.	12
...**	ERRONEOUS OFFLINE CARD** Card in error precedes message. The format for the OFFLINE card necessitates that the words PRINT and/or PUNCH appear in the operand portion. Any varying condition cannot be processed.	12

OUTPUT EXECUTION		SECTION
_____	NOT PROCESSED. NO REPORT SPECIFICATIONS GIVEN. message preceded by REPORT or REQUEST card on ANSWER tape	12
_____	PRECEDING CARD HAS AN INVALID OPERAND. REPORT WILL BE DONE USING THE NORMAL MODE card described precedes message	12
_____	PRECEDING IS AN ILLEGAL OUTPUT CONTROL CARD. CARD IGNORED AND PROCESSING CONTINUED card precedes message	12

NO ANSWER TO THIS REQUEST.

Subroutine name precedes both of the following messages:

_____	NOT ON SYSTEM LIBRARY. DATA WILL BE OUTPUT WITHOUT CONVERSION	9

OUTPUT EXECUTION	SECTION
_____ WILL NOT FIT INTO CORE. DATA WILL BE OUTPUT WITHOUT CONVERSION	9
FOLLOWING IS AN ERRONEOUS RIT NAME. REPORT WILL NOT BE DONE. _____ RIT name described follows message -	12

OUTPUT SUPERVISOR	SECTION
...** CREATE CARD ERROR - NO OPERAND** Erroneous card precedes message. If the CREATE card possesses no operand the card is unable to be processed.	12

APPENDIX E

SPECIFICATION CARD SEQUENCE

A preferred sequence of specification cards has been established in order to facilitate error detection. This appendix shows the preferred sequence for various types of reports.

SINGLE ILE PRINTED REPORTS

FILE

FORMAT PRINT

HEADER

TITLELINE

OVERFLOW

LABEL

LINE

LINE IF _____ COMPLETE

FINALLINE

TRAILER

END

Other card types such as COMPUTE, RESET, and DEFINE may be placed at any point after the file card except within the specification for one line, etc., such as LINE1, COMPUTE, LINE1, SPACE, SKIP, and EJECT may be placed adjacent to any card which causes a line to be printed. OMIT or STOP cards should be placed immediately after the FILE card separated only by COMPUTE, RESET, or DEFINE.

MULTI-FORMAT, SINGLE FILE REPORTS

FILE

FORMAT PRINT
  Print Specifications

FORMAT PUNCH

TITLECARD

CARD

FINALCARD

```
FORMAT TAPE

TITLERECORD

RECORD

FINALRECORD

END
```

As in the print format case, COMPUTE, RESET, and DEFINE cards may appear at any point. SPACE, SKIP, and EJECT cards will be in the print specifications only. OMIT and STOP cards may again be placed after the file card to condition the entire report. In the multi-format report, however, OMIT cards may also be placed after a FORMAT card to give conditional exclusion of that format. It is not necessary to place the FORMAT cards in the order shown; they may be in any order so long as the specifications for each format follow the proper format card.

MULTI-FILE, SINGLE FORMAT

```
FORMAT PRINT

HEADER

TITLELINE

FILE
-------
-------
-------          Lines, Labels for First File
-------

FILE
-------
-------
-------          Lines, Labels for Second File
-------

LINE IF _______ COMPLETE

FINALLINE

TRAILER

END
```

n the multifile report, the FILE cards are placed immediately prior to he specifications for that file. The FORMAT card comes first followed y specifications which do not require data. Control break lines (LINE F_____COMPLETE) may be used only in the multifile report if the ields specified on these cards are common to all the files and are ocated at the same position in the data record. Multifile reports may e run only from a retrieval answer tape.

ULTI-FILE, MULTI-FO

```
FORMAT PRINT

FILE

    File 1 Data Specifications

FILE

    File 2 Data Specifications

FORMAT PUNCH
-------
-------
-------

FILE

    File 1 Card Specifications
-------
-------

FORMAT TAPE
-------
-------
-------

FILE

    File 1 Record Specifications
-------
-------

FILE

    File 2 Record Specifications
-------
-------

END
```

ne multifile multiformat report has the specifications for each format s a unit. If a file is used in more than one format, the FILE card ust be repeated under each format. As in the single file, multiformat eport, the FORMAT cards may be in any order. The files used in the ormats may be the same, or different files may be placed in each format.

REQUEST RETRIEVAL AND OUTPUT

MON - Monitor

EXEQ - Execute

RT - Retrieval

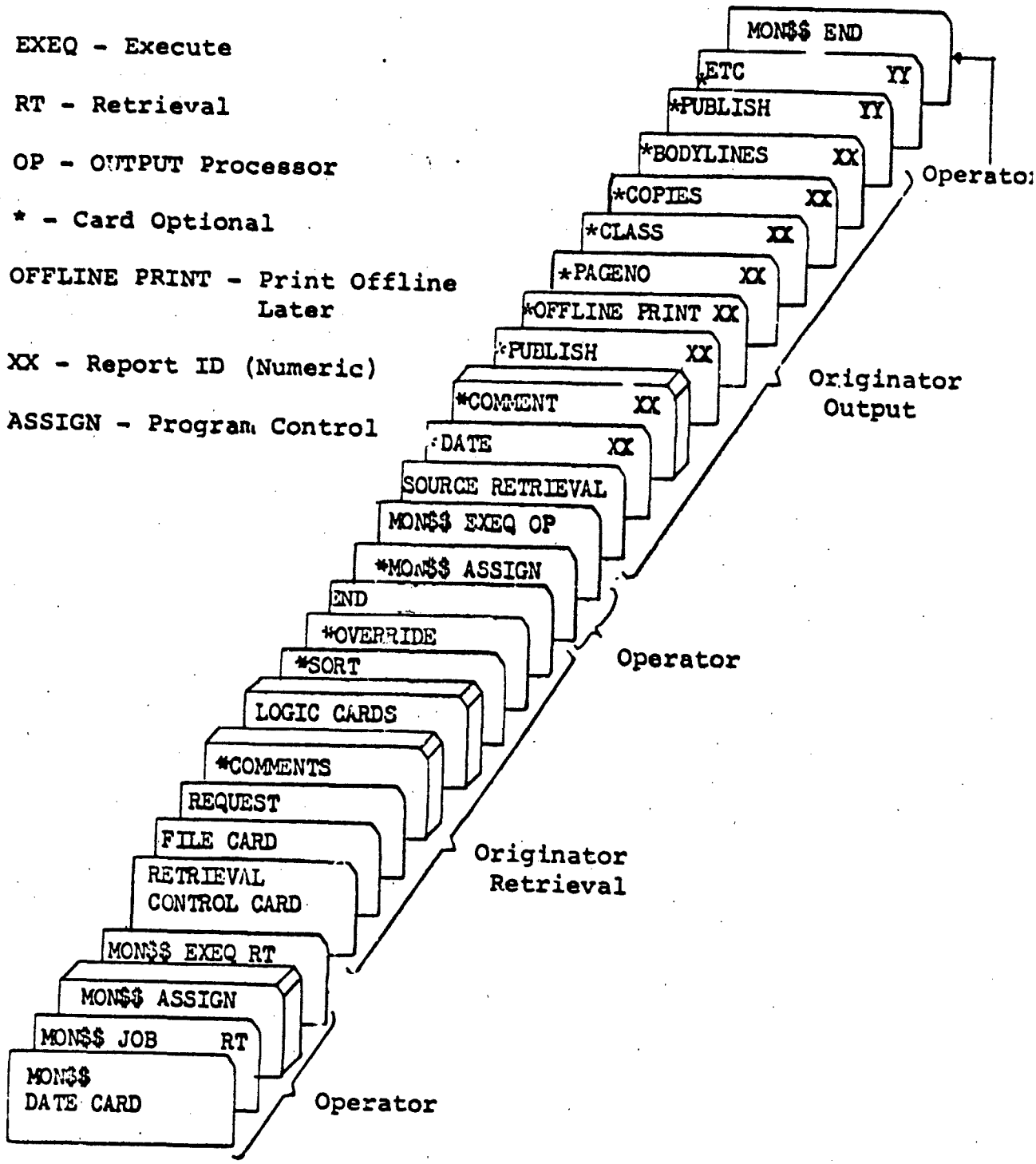
OP - OUTPUT Processor

* - Card Optional

OFFLINE PRINT - Print Offline Later

XX - Report ID (Numeric)

ASSIGN - Program Control



APPENDIX F

REPORT SPECIFICATIONS SUMMARY

The following pages contain a summary of all the specifications used in formatting a report instruction table. These specifications are listed by card type, and, under each card type, there is a listing of all possible entries on the card. Also listed are all possible conditional statements and action statements.

This summary is included as a quick reference for the student and does not give a full explanation of each specification. For a more detailed explanation of these specifications refer to the preceding section.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
FILE	XXXXX XXXXX = The five character mnemonic name of the file must end in an A or H.
FORMAT	PRINT
	PRINT, LINES, AA
	PRINT, SPACE, B
	PRINT, SIZE, CCC
	PRINT, LINES, AA, SPACE, B, SIZE, CCC
	PUNCH
	PUNCH, SIZE, CC
	TAPE, NAME, DDDDDDDDDD, RETAIN, EEE, RECORD, FFF, BLOCK, GGG

COMMENTS

A's = Number of print lines per page
B = Normal spacing required
C's = Number of output positions required
D's = Ten character Label Name
E's = Retention date in days
F's = Number of characters in record plus five
G's = Number of characters per tape block

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
	Conditional Statement
HEADERn	XX, @ACTUAL LABEL@
TRAILERn	XX, System Label
TITLELINEn	XX, Literal
TITLECARDn	XX, @ACTUAL LABEL@, Conditional Statement
TITLERECORDn	XX, System Label, Conditional Statement
	XX, Literal, Conditional Statement

COMMENTS

n = Line Level Number - not to exceed two digits.
XX = The low order print position.

NOTE:
1. The parameters of the conditional statement cannot be data fields.
2. If the entire line is to be conditioned, then the conditional statement must be the first specification for that line.
3. If the TITLE card type is specified - Titles will only appear once per report immediately following the first occurrence of the last HEADER (print only).

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
LABELn	Conditional Statement
LABELna	XX, @ACTUAL LABEL@
	XX, SYSTEM LABEL
	XX, LITERAL
	XX, @ACTUAL LABEL@, Conditional Statement
	XX, System Label, Conditional Statement
	XX, Literal Conditional Statement
	PERIODIC PER

XX = Low order output position
n = Line level number
na = Line level number followed by an alphabetic character - when the label line is directly associated with the data line.

NOTE:
1. Label Lines with an alphabetic level designation should have only one set of conditional statements and only one periodic mode statement.
2. Parameters of Conditional statements may be data fields.
3. Periodic statements must be specified before the specifications for the contents of the line if the label is to be repeated for each periodic, or omit if the label is to appear only once.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
LINE n CARD n RECORD n OVERFLOW n	Conditional Statement XX, Data Field Name XX, Literal XX, @ACTUAL LABEL@ XX, Action Statement XX, Data Field Name, EDIT } FFT entry XX, Data Field Name, TABLE } will be XX, Data Field Name, SUBRT } used XX, Data Field Name, EDIT @the actual edit word@ XX, Data Field Name, SUBRT the name of subroutine XX, Data Field Name, TABLE the name of the table XX, Action Statement, (any of the above six entries) Action Statement Periodic Mode XX, @ACTUAL LABEL@ PERIODIC } The Label will appear XX, @ACTUAL LABEL@ PER } on the same line with XX, @ACTUAL LABEL@ SET z } the periodic information.

All of these entries may be followed by a conditional statement.

NOTE:
1. n = Line level number
2. XX = Low order output position
3. All underscored words are key words and must appear in the entry.
4. Partial field notation may be used on all data fields and literals if the data field is not being processed by an FFT subroutine or table.
5. z = Periodic set number
6. Possible periodic modes are: SCAN, SCAN SET(z), FIRST m FIRST m SET z, LAST m, LAST m SET z, ALL, ALL SET z.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
FINALLINEn	Conditional Statement
FINALCARDn	XX, @ACTUAL LABEL@
FINALRECORDn	XX, System Label
	XX, Literal
	XX, Action Statement
	XX, @ACTUAL LABEL@, Conditional Statement
	XX, System Label, Conditional Statement
	XX, Literal, Conditional Statement
	XX, Action Statement, Conditional Statement

COMMENTS:

1. Parameters of the conditional statement cannot be data fields.
2. Final lines may contain data from a record only if that data has been stored in a literal prior to its use.
3. n = Line level number
4. XX = Low order output position

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES	
RESET	Area Name Area Name, Conditional Statement Area Name TO_____ Area Name TO_____, Conditional Statement System Label System Label TO_____ System Label, Conditional Statement System Label TO_____, Conditional Statement	NOTE: Areas are either reset to zeros or to the literal specified with true sign over units.
SPACE	n, n, Conditional Statement n, Format Statement n, Format Statement, Conditional Statement	n = The number of spaces required
SKIP TO	n, Conditional Statement n, Format Statement n, Format Statement, Conditional Statement	n = The number of the channel the carriage will skip to
EJECT	Conditional Statement Format Statement Format Statement, Conditional Statement	NOTE: If a format statement and a conditional statement appear on the same line for SPACE, SKIP TO, or EJECT then the conditional statement must be last. BETWEEN RECORDS must accompany IF_____ COMPLETE.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
DEFINE	Literal Name, @The Literal@ Literal Name, XXX Where XXX is the size of a workarea to be referred to by name, the size of the area is expressed in 3 digits or less.
FOR PERIODIC FIELDS	
DEFINE	PERIODIC, Literal Name, @The Literal@ PERIODIC, XXX PER, Literal Name, @The Literal@ PER, XXX SETn Literal Name, @The Literal@ SETn XXX n - refers to a specific periodic set
OMIT	Conditional Statement: 1. If placed after the FILE card and before the FORMAT card will omit all formats for that file. 2. If placed after the FORMAT card will only omit the specifications for the specific format.
STOP	Conditional Statement: 1. Must be the first Statement following the FILE card for the FILE it pertains to.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
EXTRACT (NORMAL)	ALL FIELDS Periodic Mode Data Field A, Data Field B, Data Field C, etc. Data Field A . Data Field B, Data Field C, etc. Data Field A . Data Field B, Data Field C, etc. NOTE: 1. The output program will format the labels and data lines automatically for any given report as designated by the FFT. 2. A period terminates a line. Any field following it will print on the next line. The period must be treated as a separate parameter. 3. Any number of continuous lines may be stated. 4. Possible periodic modes are: SCAN, SCAN SET z, FIRST m, FIRST m SET z, LAST m, LAST m SET z, ALL, ALL SET z.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
EXTRACT (EXTENDED)	If the user wishes to use his own labels or include literals or perform simple arithmetic, or use the IF_____ COMPLETE statement he may write the specifications as follows: Data Field, LABEL, @ACTUAL LABEL@, etc. Data Field, LABEL, Defined Literal Action Statement Action Statement, LABEL @ACTUAL LABEL@, etc. Data Field, @Literal@, etc. Data Field, Defined Literal, etc. Action Statement, AT END System Statement, AT END @LITERAL@, AT END @LITERAL@, Action Statement, AT END Action Statement IF _____ COMPLETE System Label IF _____ COMPLETE @LITERALS@ IF _____ COMPLETE Data Field IF _____ COMPLETE

NOTE:

All underscored words are Key Words

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ENTRIES
COMPUTE	Result Area, EQ, COUNT OF _____
	Result Area, EQ, TOTAL OF _____
	Result Area, EQ FACTOR A ADD FACTOR B, etc. SUB MUL DIV

COMMENTS:

1. Underscored words are Key Words.
2. A maximum of three continuous cards ("C" column 72 if continuous) may be used to express the computation.
3. Arithmetic symbols may be used in the operator as well as the expressions above + = Add; - = Sub; * = Mul; / = Div.
4. For various compute operations the Factor A field and Factor B field represent the following:

	FACTOR A	FACTOR B
Divide	Dividend	Divisor
Multiply	Multiplicand	Multiplier
Add (Add to)	Augend	Addend
Subtract (Sub from)	Minuend	Subtrahend

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE CONDITIONAL STATEMENTS
	IF parameter EQUALS / NOT EQUAL TO / LESS THAN / NOT LESS THAN / GREATER / NOT GREATER parameter
	IF parameter (Conditions As Above) parameter AND/OR parameter (Conditions As Above) parameter, etc.
	IF parameter CHANGES IF parameter NOT CHANGE IF parameter COMPLETE
	IF SORT (partial) (field notation) CHANGES IF QUERYNO CHANGES IF FILENAME CHANGES } Addressing Sort Key
	AT END (Extract Only)
	NOTE: Parameters may be data fields, literals, system labels, and area defined literals. Reference will have to be made to each card type in order to determine the various limitations placed on the condition statement.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE ACTION STATEMENTS
LINE	XX TOTAL OF _____ (Numeric Field)
CARD	COUNT OF _____ (Unit Count By Field Name)
RECORD	XX Dividend DIV Divisor
OVERFLOW	XX Multiplicand MUL Multiplier
FINALLINE	TOTAL OF _____ IN _____ (Totals numeric field in some area)
FINALCARD	COUNT OF _____ IN _____ (Totals Unit Count in some area)
FINALRECORD	ADD _____ TO _____ (Numeric field or literal to literal)
	SUB _____ FROM _____ (Numeric field or literal from literal)
	MOVE, Area Name TO Literal Area
	COMPUTE Result Area EQ TOTAL OF _____ (Total of numeric field or literal)
	COMPUTE Result Area EQ____ MUL____DIV____ADD____SUB____, etc.
	COMPUTE Result Area EQ____ * ____ / ____ + ____ - ____, etc. (_____ = Numeric Field)
	RESET, Literal
	RESET, Literal TO _____

NOTE:
1. XX = The units position of the result. The result area is cleared after output.
2. Where no output position (XX) is indicated the results are stored indefinitely.

REPORT FORMAT SPECIFICATIONS (SUMMARY)

CARD TYPE	POSSIBLE FORMAT CONTROL STATEMENT
SPACE	n, BEFORE (card type) n, BETWEEN RECORDS*
EJECT	BEFORE (card type) BETWEEN RECORDS*
SKIP TO	(n) BEFORE (card type) (n) BETWEEN RECORDS*

n = The number of spaces required

n = The carriage channel to SKIP TO

* IF _____ COMPLETE can be used with BETWEEN RECORDS specification. BETWEEN RECORDS must be used when IF _____ COMPLETE is used.

APPENDIX G

SAMPLE PROBLEMS

SAMPLE PROBLEM 1

This problem is designed to illustrate the procedures necessary to produce a printed report. The first illustration is a Print Space Chart, which is a layout of all the possible print positions. This page is filled in with labels, literals, and data fields to achieve the desired layout. Then Report Specifications are written to produce this layout. These specifications are illustrated next along with footnotes to point out certain specifications. Note that three control cards precede the specifications. A source card is used to indicate the source of data, a date card is used to insert a particular date, and a publish card to indicate that report specification cards will follow. The last portion of the problem is an explanation of the footnotes.

IBM

INTERNATIONAL BUSINESS MACHINES CORPORATION

IBM 407, 408, 409, 1403 AND 1404 PRINTER SPACING CHART

6 Lines Per Inch

IBM 1403, Model 1

IBM 407, 408, 409

IBM 1403 & 1404 Model 2

GLUE

HEADER1

HEADER2

HEADER3

HEADER4

LABEL 2

LINES

LABEL 3

LABEL 4

LINES

LABEL 5

LABEL 6

LINES

TRAILER1

UNCLASSIFIED

PAGE X X

AIRPORT FILE

PASSENGER AND AIRCRAFT HANDLING STATISTIC

INFORMATION DATE

X X

STATE

X X

AIRPORT NAME

CITY

RUNWAY COORDINATES

MAXIMUM AIRCRAFT CAPACITY PER DAY

MAXIMUM PASSENGER CAPACITY PER DAY

X X X X X X X X

XXX

PASSENGER DATA

DAY

PERCENT OF CAPACITY

NUMBER OF PASSENGERS

XXX XXX X X

AIRCRAFT DATA

PERCENT / NUMBER OF AIRCRAFT

XXX X X X X X XXX X X XXX X X X

CLASSIFIED

MEASUREMENTS

DLAM 65-9-2

CONTROL AND SPECIFICATION CARDS FOR PROBLEM 1

```
(1)  SOURCE DIRECT
     DATE 14 JUL 1964          CONTROL CARDS
     PUBLISH SPECIAL
     FILE AIR A
     FORMAT PRINT, LINES 55
     HEADER1, 71, @UNCLASSIFIED@
     HEADER1, 1Ø3, @PAGE@
     HEADER1, 11Ø, PAGENO
     SPACE 2
     HEADER2, 71, @AIRPORT FILE@
     SPACE 2
     HEADER3, 76, @PASSENGER AND AIRCRAFT@
     HEADER3, 121, @INFORMATION DATE@
     HEADER4, 75, @HANDLING STATISTICS@
(2)  HEADER4, 118, OPDATE
     SPACE 5
     SPACE 3 BEFORE OVERFLOW1
(3)  OVERFLOW1, 24 STATE TABLE
     OVERFLOW1, 35 @CONTINUED@
     SPACE 2
     LABEL1, 14 @STATE@
     SPACE 2
(4)  LINE1, IF STATE CHANGES
(5)  LINE1, 24, STATE TABLE
     SPACE 3
     LABEL2A, 6Ø, @AIRPORT NAME  CITY  RUNWAY COORDINATES@
     LABEL2A, 119, @MAXIMUM AIRCRAFT CAPACITY MAXIMUM
                    PASSENGER CAPACITY@ (same card)
                       NOTE:  The number of blanks desired
                              between label words must be
                              inserted in the card.
     LABEL2B, 80, @PER DAY@
     LABEL2B, 1Ø9, @PER DAY@
     SPACE 2
     LINE2, 21, AIRPORT
     LINE2, 37, CITY
(6)  LINE2, 61, LOCATION SUBRT
     LINE2, 78, ACCAP EDIT @ØØØØ@
(7)  LINE2, 1Ø7, PDAY MUL 1ØØ
     SPACE 2
     LABEL3, 55, @PASSENGER DATA@
```

```
        LABEL4 20, @DAY@
        LABEL4 49, @PERCENT OF CAPACITY@
        LABEL4 80, @NUMBER OF PASSENGERS@
        SPACE 2
(8)     LINE5 FIRST 7 SET 1
        LINE5 20, DAY
        LINE5 41, PPSCP
(9)     LINE5 73, PDAY MUL PPSCP
(10)    SPACE 2 BEFORE LABEL6
        LABEL6 71, @AIRCRAFT DATA@
        LABEL7 78, @PERCENT / NUMBER OF AIRCRAFT@
        SPACE 2
        LINE8, 7, 25, 43, 61, 79, 97, 115 PACCP EDIT @ƀØØƀ%@
        LINE8, 16, 34, 52, 70, 88, 106, 124 ACCAP * PACCP / 100
(11)    EJECT BETWEEN RECORDS IF __________ COMPLETE
        TRAILER1, 71, @UNCLASSIFIED@
```

FOOTNOTES TO PROBLEM 1

(1) Publish a report directly from the file using the SPECIAL mode where the report format specifications follow the output control cards.

(2) An example of the use of a system label (OPDATE). The date will be the date specified on the DATE card.

(3) The overflow line will be printed only if the next line of the report is not the first data line.

(4) An example of a line level conditional statement.

(5) An example of using a TABLE to convert a 5 character STATE field to a 14 character output.

(6) An example of the use of the output term SUBRT. This specification will cause the subroutine associated with the field in the FFT to be used.

(7) An example of the short form compute statement.

(8) An example of the use of the periodic set mode specification. This example will cause printing of the first seven subsets of one set (the days of the week) in the positions specified.

(9) An example of the short form compute statement with multiple occurrences of subsets.

(10) An example of the use of the SPACE # BEFORE _____ expression after a periodic line.

(11) An example of the use of the EJECT BETWEEN RECORDS IF _____ COMPLETE expression to start the data for each state on a new page.

SAMPLE PROBLEM 2

This problem is designed to illustrate the Control Cards and Report Specifications required for a Print and Punch format. It will also designate that the formatted reports be placed on Offline Tape. This Offline Tape can be processed later to produce the printed and punched outputs. Included with the example is the original Retrieval problem and the necessary Request Specifications. These are included to demonstrate how an Output report can be designed to produce a printed or a punched card output of the resultant answer Tape.

The control cards will precede the Report Specification cards. The cards may be entered into the system to produce the required output. (NOTE: The PUBLISH SPECIAL card indicates that the Report Specification cards <u>must</u> follow.)

The Print Format shows the use of:

Header lines with literals

Header lines with System labels

Spacing before and after printing

Data lines

Final lines with count

Trailer lines

The Punch Format shows the use of:

A Define area literal

Data for card

An Add to operation

Final card

Card code identification

The sequence of the illustrations will be:

Retrieval problem

Retrieval request format

Print space chart

Card Output Layout

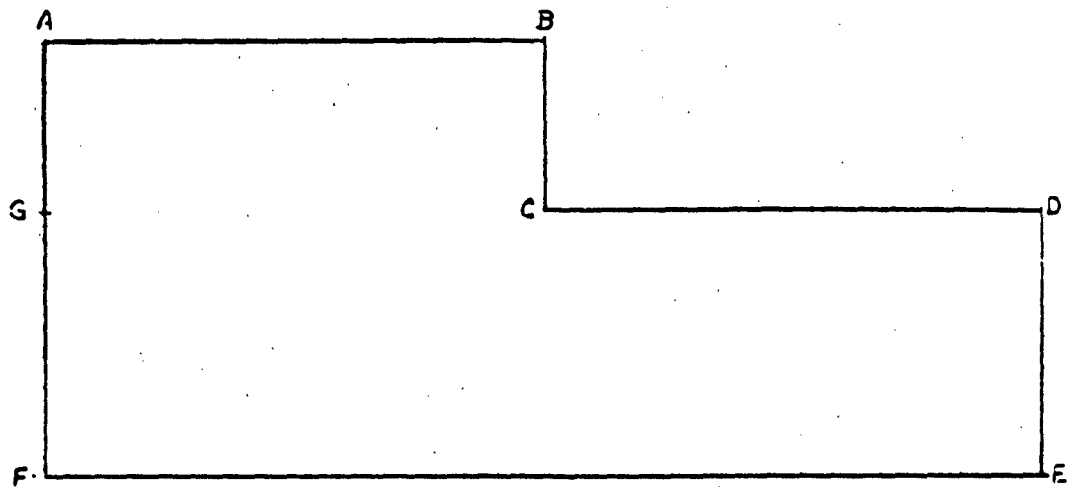
Control cards and Report Specifications

SAMPLE PROBLEM 2

RETRIEVAL PROBLEM

The problem for Retrieval is to determine from the "COMMERCIAL FLIGHT FILE" any commercial aircraft whose flight path penetrated an air space being reserved for a military air demonstration on May 15, 1965. The restrict airspace was reserved up to an altitude of 25,000 feet. The answers to the Request are desired in the natural ord of the file.

The following diagram shows the restricted area:



Coordinates for Points*

A. 39153ØNØ7535ØØW

B. 39153ØNØ7518ØØW

C. 391ØØØNØ7518ØØW

D. 391ØØØNØ75ØØØØW

E. 3858ØØNØ75ØØØØW

F. 3858ØØNØ75[illegible]ØØW

G. 391ØØØNØ7535ØØW

*NOTE: It was previously mentioned that 15 character coordinate forma in the data record may not be used with the polygon operator. For th example, however, it is assumed that the coordinate format in GEREF contains the required 11 or 13 character standard form.

ANALYST SMITH

FILE NAME CMEA

PLOT? YES ☐

NO ☒

PAGE 1 OF 1

IDHS/FFS

EDP REQUEST FORM

FILE NUMERIC (71 72) 07

GROUP ID (73 74) 02

SEARCH NO. (75 78) 00

SEQUENTIAL NUMBERING COL 79-80

1 5 10 15 20 25 30 35 40 45 50 55 60 65 70	RFTID	LOG NO.	ANAL. CODE	RUN NO.	DATE D M Y	79-80
REQUEST						01
COMMENT CARDS HAVE "*" IN COL 1 FIRST LOGIC CARD FOLLOWS COMMENT CARDS, STARTING WITH "IF" IN COL 1						
* THIS REQUEST WILL DETERMINE ALL AIRCRAFT CROSSING A RESERVED						02
* AIRSPACE AT AN ALTITUDE OF 12,000 FEET OR LESS. THE AIRSPACE						03
* IS DIVIDED INTO TWO POLYGONS DUE TO ITS CONCAVE SHAPE.						04
*						05
IF,DMONTH,EQUALS,05,						06
AND,TDATE,EQUALS,15,						07
OR,LDATE,EQUALS,15,						08
AND,ALTID,IS EQUAL TO OR LESS THAN,250,						09
AND,GEREF,OVP,385800N0750000W,391000N0750000W,						10
385800N0750500W,391000N0750500W;						11
OR,GEREF,OVP,391000N0751000W,391530N0751000W,						12
391000N0750500W,391530N0750500W;						13
SORT						
OVERRIDE						

IBM

INTERNATIONAL BUSINESS MACHINES CORPORATION

IBM 407, 408, 409, 1403 AND 1404 PRINTER SPACING CHART

6 Lines Per Inch

Form 824-3117-2
Printed in U.S.A.

DIAM 65-9-2

LINE DESCRIPTION — FIELD HEADINGS WORD MARKS — Printing space

IBM 1403 Model 1
IBM 407 408 409
IBM 1403 & 1404 Model 2

GLUE

HEADER 1
HEADER 2
HEADER 3
HEADER 4
HEADER 5
HEADER 6
LINE 1
LABEL 2
LABEL 3
LINE 4
FOOTER 1
TRAILER 1

0 1 2 3 4 5 6 7 8 9 10 11 12 13

UNCLASSIFIED

DATE

PAGE

AIR CONTROL ZONE

XX XX XX

XXXXXX

ALL SCHEDULED COMMERCIAL AIRCRAFT THAT CROSSED A RESERVED AIRSPACE

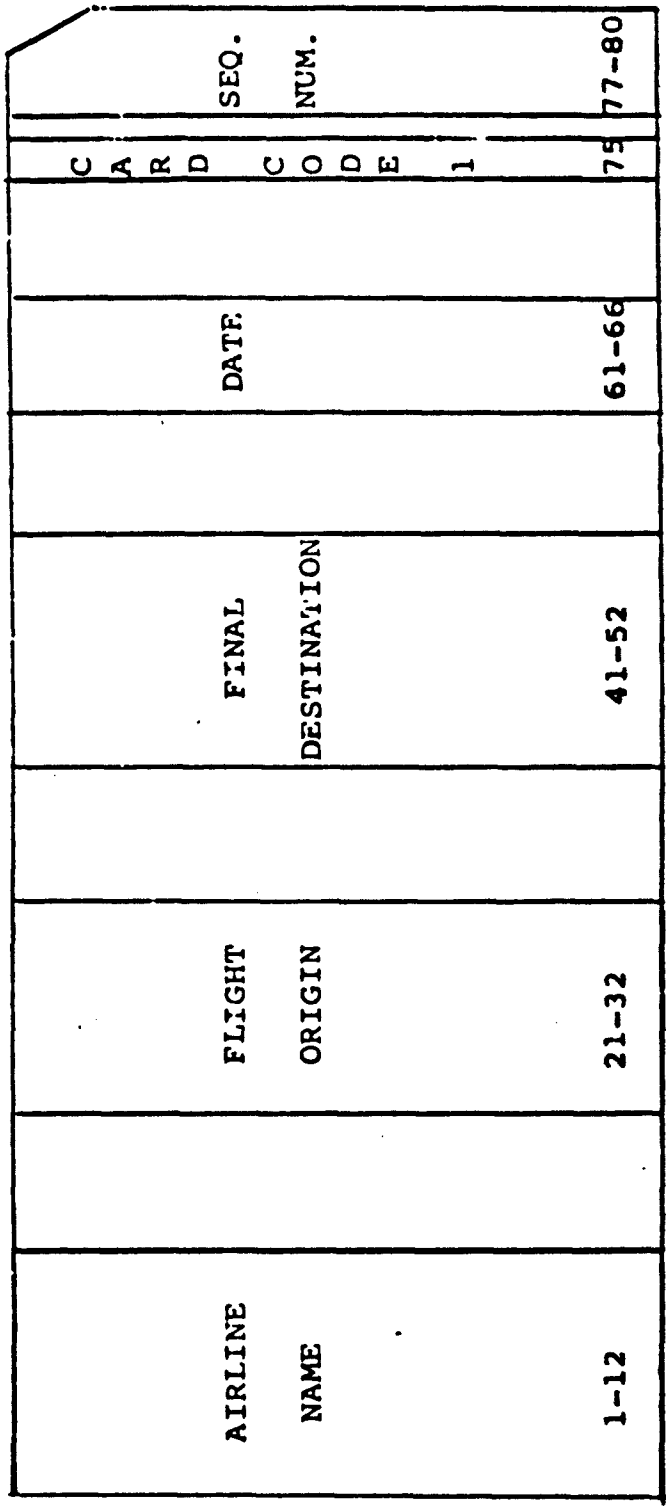
AT AN ALTITUDE LESS THAN OR EQUAL TO 25 000 FEET ON MAY 14, 1965

AIRLINE NAME	FLIGHT ORIGIN	FINAL DESTINATION	FLT NO.	TYPE OF AIRCRAFT
X——X	X——X	X——X	XX	XXXX

LEG ORIGIN	LEG TERMINATION	ORIGIN COORDINATES	TERMINATION COORDINATES	TAKE OFF TIME	LANDING TIME	ALTITUDE	FLIGHT LEG
X——X	X——X	X——X	X——X	X——X	X——X	X——X	X——X

TOTAL NUMBER OF AIRCRAFT X——X

UNCLASSIFIED



CARD LAYOUT FOR PROBLEM 2

CONTROL AND SPECIFICATION CARDS FOR PROBLEM 2

CONTROL CARDS

```
SOURCE RETRIEVAL
DATE 051665
OFFLINE PRINT, PUNCH, 1000,
CLASS                UNCLASSIFIED
PAGENO 100
COPIES 6
BODYLINES 50
PUBLISH SPECIAL
```

SPECIFICATION CARDS

```
FILE CMFLA
FORMAT, PRINT, LINES 40
HEADER1, 69, CLASSIF
HEADER1, 127, @DATE            PAGE@
SPACE, 2
HEADER2, 62, @AIR CONTROL ZONE@
HEADER2, 114, OPDATE, EDIT, @ØØ-ØØ-ØØØ@
HEADER2, 128, PAGENO
SPACE, 3
HEADER3, 74, @ALL SCHEDULED COMMERCIAL AIRCRAFT THAT CROSSED@
HEADER3, 94, @A RESERVED AIRSPACE@
SPACE, 2
HEADER4, 77, @AT AN ALTITUDE LESS THAN OR EQUAL TO 25,000 FEET,@
HEADER4, 93, @ON MAY 15, 1965@
SPACE 4,
HEADER5, 9, @AIRLINE@
HEADER5, 21, @FLIGHT@
HEADER5, 35, @FINAL@
HEADER5, 45, @FLT@
HEADER5, 56, @TYPE OF@
HEADER6, 7, @NAME@
HEADER6, 21, @ORIGIN@
HEADER6, 38, @DESTINATION@
HEADER6, 45, @NO.@
HEADER6, 57, @AIRCRAFT@
SPACE 2 BEFORE LINE1
LINE1, 9, AIRLINE
LINE1, 24, FLIGHT-ORIGIN
LINE1, 39, DESTØ
LINE1, 45, FLTNO
LINE1, 55, ACTYP
SPACE, 3
```

```
LABEL2, 8, @LEG@
LABEL2, 23, @LEG@
LABEL2, 41, @ORIGIN@
LABEL2, 62, @TERMINATION@
LABEL2, 75, @TAKE OFF@
LABEL2, 86, @LANDING@
LABEL2, 98, @ALTITUDE@
LABEL2, 108, @FLIGHT@
LABEL3, 10, @ORIGIN@
LABEL3, 27, @TERMINATION@
LABEL3, 44, @COORDINATES@
LABEL3, 62, @COORDINATES@
LABEL3, 73, @TIME@
LABEL3, 84, @TIME@
LABEL3, 106, @LEG@
SPACE, 3
LINE4, 13, LORIG
LINE4, 28, LTERM
LINE4, 46, OCOOR
LINE4, 64, TCOOR
LINE4, 73, TTIME
LINE4, 84, LTIME
LINE4, 96, ALTTD
LINE4, 108, LXOFY, EDIT, @ØØOFØØØ@
SPACE,2, BEFORE FINALLINE1
FINALLINE1, 123, @TOTAL NUMBER OF AIRLINES@
FINALLINE1, 130, COUNT OF AIRLINE
SPACE, 3, BEFORE TRAILER1
TRAILER1, 69, CLASSIF
FORMAT, PUNCH
DEFINE, SEQNUM, 4
CARD1, 12, AIRLINE
CARD1, 32, FLIGHT-ORIGIN
CARD1, 52, DESTØ
CARD1, 66, OPDATE
CARD1, 75, @1@
CARD1, ADD 1 TO SEQNUM
CARD1, 80, SEQNUM
FINALCARD1, 9, @LAST CARD@
END
```

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