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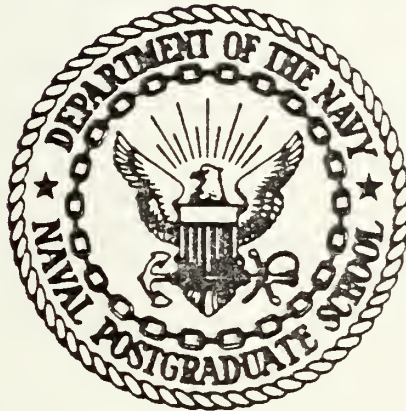
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A COMPUTER-ASSISTED
PETTY OFFICER ASSIGNMENT SYSTEM
FOR THE TURKISH NAVY

Celal Seyhan

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

A COMPUTER-ASSISTED
PETTY OFFICER ASSIGNMENT SYSTEM
FOR THE TURKISH NAVY

by

Celal Seyhan

June 1976

Thesis Advisor:

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A Computer-Assisted
Petty Officer Assignment System
for the Turkish Navy

by

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Lieutenant (Junior Grade), Turkish Navy
Turkish Naval Academy, 1970

Submitted in partial fulfillment of the
requirements for the degree of

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June 1976

ABSTRACT

A computer-assisted petty officer assignment model for the Turkish Navy has been formulated and developed. The objective of the model is to assist the personnel officer in making decisions during the petty officer assignment process.

The history and the personnel organization of the Turkish Navy are described for background purposes. Data bases for personnel characteristics and billet requirements have been created. Weighting factors which affect the assignment decision have been described. In addition, the processing of the model has been described in a detailed manner and flowcharts of the model have been included. Management Information System (MIS) implementation plans and a network diagram have been presented and explained.

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I. INTRODUCTION

To assign military personnel to vacant billets manually is a very complex and time-consuming task, even in relatively small armed forces. A great deal of effort has been expended and a variety of approaches have been considered in analyzing the assignment problem.

Manual systems have been used with some degree of success for years, and it now appears that a computer can complement and assist the personnel officer in the assignment process. Automating the assignment system appears to have numerous advantages, some of which are as follows:

1. A better match between billets and personnel.
2. A more efficient use of time by the personnel officer.
3. Ability to obtain pertinent information rapidly.
4. Assuring that personnel are rotated in a timely fashion, so that they serve neither too long nor too short a tour of duty in any one location.
5. Equity in assignment of billets.

Because of the size, importance, and complexity of the personnel assignment problem, computer-based mathematical models appear to represent a reasonable means of improving the efficiency of a personnel assignment system.

In order to effect an improvement in the personnel assignment system, this thesis sought to:

1. Investigate the possibility of utilizing Automatic Data Processing (ADP) to assign personnel to available billets in the Turkish Navy.

2. Develop a data base and to create an assignment model for Turkish Naval Petty Officers.

Although the successful application of ADP to large personnel systems has not always met with success in the past [Refs. 1 and 24], it appears that aspects of the current Turkish Naval assignment system may reduce the difficulty of the problem. In particular, in the Turkish Navy all transfers, assignments and promotions are performed only one time during a year, in August. This policy significantly simplifies the assignment problem.

II. HISTORY AND GENERAL PERSONNEL ORGANIZATION

A. HISTORY OF THE TURKISH NAVY

The Turks, whose forebears in the course of the centuries flowed from Central Asia to Asia Minor, settled, after their victory at Malazgirt, in the area extending to the shores of the Mediterranean and made the whole peninsula their homeland. The history of the Turkish Navy, full of gloried pages, starts, in fact, after this settling.

The Seljuk Turks, recognizing the importance of seafaring in world politics and in the survival of nations, asked one of their military leaders, Caka Bey, to establish the first Turkish Naval Base and Navy Dockyard in Ephesus.

Caka Bey is considered to be the first Turkish Admiral to have delivered the initial blow to the Byzantines, by engaging on May 19, 1090 their fleet under the command of Nekata Kastamonika in the vicinity of the Koyun Islands. Caka Bey's unit consisted of forty vessels built in the dockyard of Izmir by Turkish engineers and craftsmen, and this battle demonstrated the heroism of the Turks in a naval fight. Very soon, the Byzantine Admiral understood his tactical as well as his technical weakness and tried to disengage his fleet by retreating. But Caka Bey had some reserve forces waiting outside the deadly ring and these rammed and sunk the fleeing units.

Under Gazi Umur, the Ruler Aydin during the expansion period of the Ottomans, the Turks firmly reinforced their

mastery in the Aegean Sea, and by protecting with the Navy their overseas trade lanes strengthened the national economy. They also founded shipyards in several ports of the Marmara, the Black Sea and the Mediterranean. During the siege of Istanbul, the Turkish naval power blockaded the entire Marmara coast and put an end to the Greek pirate activities in the Black Sea. While Byzantium was besieged, Turkish galleys were moved from the Bosphorus over the hill of Dolmabahce to the Golden Horn, putting the Byzantine army literally between two fires and helping in the surrender of the city.

After Istanbul's conquest, the most important event was the founding of the Naval Dockyard in the Golden Horn and its development during the second half of the Fifteenth Century.

The Turks then seized the islands of the Dodecanese and thus put the entire eastern Mediterranean under their control, connecting the trade routes passing through Syria and Egypt with their homeland.

In the middle of the Sixteenth Century, the Turkish naval power reached its apex. In 1538, the great Turkish Admiral Barbaros Hayreddin defeated the crusaders' navy at Preveze, transforming the Mediterranean into a Turkish lake. During the same period, vessels belonging to the Western fleet even reached the oceans, displaying the splendor of the Ottoman Empire under the command of famous admirals such as Piri Reis, Turgut Reis and Kilic Ali Pasha. Trade lanes in

the Mediterranean were covered and controlled by units of three major naval organizations called the Derya Beyleri Fleet, the Western Fleet and the State Fleet.

During the XVIIth Century, those holding the reins of the Empire were unable, unfortunately, to grasp the ever-increasing importance of the seas to the development of the country and to its prosperity, with the inevitable result of keeping the Imperial Navy away from the high seas while Portugal, Holland and England were building strong navies in their endeavor to find new markets and new sources of wealth.

The XVIIIth century sees the assignment to the top Navy position of Kaptani Derya of persons lacking not only of background but also devoid of professional capacity, thus starting the regression of the Turkish Navy. However, amidst the general decline there were some patriotic statesmen wanting to correct the prevailing situation.

One of them put in the foundation of what is today the Turkish Naval College in 1773, during the reign of Sultan Selim III, giving an impetus to the somewhat staggering Navy and developing the dockyards so they could build navy vessels in line with the technical standards of the century.

In spite of all those endeavors, the Ottoman Empire was not able to keep pace with the industrial evolution which took place in Europe in the field of shipbuilding when, during the XIXth century wooden ships and sailing vessels became obsolete in the Navy and were replaced by steel ships

which used steam propulsion. However, towards the end of the past century, the Turkish Navy managed to get reorganized and the dockyards began to build steam vessels. This occurred during the reign of Sultan Aziz, but, unfortunately, the prevailing religious fanaticism kept the new and powerful modern ships that were launched in the Golden Horn inactive and in a state of gradual decay.

During the decay called the "Constitutional Period" (1908 - 1918), again major attempts were made regarding modernization and reactivation of the Navy, and in spite of the limited possibilities available, Turkish naval units shook the entire enemy coastline.

World War I again witnessed heroic achievements of the Turkish Navy, especially in preventing the breakthrough of overwhelming Allied naval units in the Dardanelles.

In the course of the War of Independence, Turkish sailors manning the small craft they managed to "smuggle" from the Marmara to the Black Sea, covered the Black Sea coast and ports, and in true spirit of self-sacrifice and abnegation were able to transport, on board hastily repaired ships, 250, 000 tons of weapons and ammunition to the fighting land forces in Anatolia, thus playing a major role in the final victory.

With the proclamation of the Turkish Republic, great importance was placed on shaping the navy, whose proficiency would meet all the demands of modern requirements. The Turkish Navy thus became a ready and powerful factor in the defense and independence of the country.

Turkey's objective is to create, by reaching a high degree of technology, a Navy strong enough to fulfill all the missions of the country. Keeping in the forefront the high role the oceans have to play in the interests of modern nations, the Navy's courageous and self-sacrificing spirit makes the naval forces a reliable support factor in the politics of the country.

B. OFFICERS AND OFFICER SOURCES

There are three main sources for officer personnel (see Appendix A):

1. Naval College and Naval Academy

a. Naval College

Entry to the Naval College occurs after three years of high school training. In Turkey, high schools encompass a six-year term and are called "high school" for the first three years and "lycee" for the last three years. The Naval College is a "naval lycee" in this sense, and it accepts the students who finished the first three years of high school training in a civilian high school. The willing high school graduates take an exam and the students who achieve a score above a specific minimum, can enter the Naval College. Naval College training lasts three years.

b. Naval Academy

Entry to the Naval Academy can occur in two ways:

(1) the Naval College graduates directly enter the Naval Academy as cadets,

(2) if the number of officers who graduate after four years from the Naval Academy is greater than the number

of students graduating from the Naval College, then some students can be chosen based upon a written examination from among the willing civilian lycee graduates.

The Naval Academy training lasts four years. Ninety-five percent of the Turkish Naval Officers come from this source. There is no rank limitation for the officers who are graduates of the Naval Academy.

2. Civilian University

The Navy needs some physician officers, lawyer officers, engineer officers, chemist officers, etc.. These officers are trained in civilian universities and the Navy pays their school expenses. Their training period depends on the university. The highest rank for the officers from this source is rear admiral. Four percent of the Turkish Naval Officers come from civilian universities.

3. Petty Officers

When the petty officers are promoted to the Petty Officer 2nd Class rank, willing petty officers who have appropriate fitness reports may take an exam, and the petty officers who achieve a successful grade will become officers. The highest rank for these officers is lieutenant and one percent of the Turkish Naval Officers come from this source.

C. PETTY OFFICERS AND SOURCES

There are two main sources for petty officers (see Appendix B):

1. Petty Officer School and Petty Officer Orientation Course

a. Petty Officer School

After three years of civilian high school training an individual is eligible to enter Petty Officer School. High school graduates compete on a written examination and the students who achieve a score above a specific minimum are able to enter the Petty Officer School. Petty Officer School training lasts two years.

b. Petty Officer Orientation Course

After graduation, the Petty Officer School graduates enter a Petty Officer Orientation Course which lasts eight months.

2. Direct Entry To the Petty Officer Orientation Course

If the number of petty officers who are expected to graduate from the eight month Petty Officer Orientation Course (POOC) does not meet the quota for expected input to the fleet, then an appropriate number of candidates can be assigned directly to the POOC from among trade school graduates on an examination basis.

The general training organization for petty officers is as follows (see Appendix C). After they graduate from Petty Officer Orientation Course, they are assigned to a ship for six months at sea in a training status; after this sea training, they are assigned to responsible duties.

D. CONSCRIPTS

In Turkey, every man who reaches 20 years of age (excluding military personnel) has to serve his country for two years in the armed forces. There are three means to accomplish this service (see Appendix D):

1. If a man did not graduate from the university and quit the training, he will serve as a conscript for his country.
2. If he has not graduated and is still training at the university, then the government will wait for him to complete his training.
3. If he has graduated from the university but has quit the training, he will serve his country as a supplementary officer (i.e., short-term specialist) in the armed forces.

There is no way for conscripts to become petty officers.

E. CIVILIAN PERSONNEL

Civilian personnel have the same status as government officials. They work mainly at the support facilities (mostly at the shipyards) and the Navy pays their salaries.

III. ANALYSIS AND DEFINITION OF PROBLEM

A. SYSTEMIC ASSUMPTIONS

Because of the difficulty of obtaining detailed data, some assumptions are made. Some of the assumptions discussed below were in force when the author left Turkey in 1974. It is assumed that they are still valid. Also, it should be noted that future changes in the Turkish Navy personnel policies may require modification of these assumptions. The following factors must be considered in the model:

1. Ranks and Regular Periods

The system is composed of six ranks:

Leading Seaman	3 years
Leading Seaman (Senior)	3 years
Master Seaman	3 years
Petty Officer 2nd Class	3 years
Petty Officer 1st Class	3 years
Chief Petty Officer 2nd Class	5 years

2. Promotions

Every petty officer who completes the regular period of his rank and attains a successful fitness report grade will automatically be promoted at the end of his regular period.

A petty officer who cannot attain a successful grade in a specific year loses one year in that rank. If, during the next year, he fails again, he loses two years in that rank, etc.. Maximum lost time in a specific rank is assumed to be five years. If someone fails for more than five years, he will be discharged from the Navy.

3. Courses

The personnel officer must make certain assumptions concerning the training. For consistency in the approach to this problem, training which lasts longer than two weeks is counted as a course. Training periods lasting two weeks or less will not be counted as a course. For data base purposes a maximum of five courses will be allowed. In the case of more than five courses, the last or longest five courses will be taken into consideration. Last or longest means that the Naval Personnel Bureau may exercise its management option over these two choices. To arbitrarily choose one of these two options is quite difficult. This difficulty can be exemplified as follows.

If, for a particular petty officer, the last five courses are taken into consideration, a course which he had before any of these five courses may have been the longest and most useful course of his career. Therefore, this thesis leaves the decision as to which five courses to select up to the Personnel Officer.

4. Priority of Billets

Personnel officer must consider the priority of billets during the assignment process. It is suggested that two classes of priorities be established. One means of establishing priorities for billets might be as follows:

a. Shore Billets

A committee will assemble under the command of the Unit Commander and this committee will establish the priorities of all billets in the organization.

b. Sea Billets

For each flotilla, a committee which includes the Commanding Officers, Executive Officers, Chief Engineers of all ships will assemble under the command of Flotilla Commodore and this committee will establish the priorities of all billets in the flotilla.

5. Compulsory Service

The assumption is made that all petty officers serve ten years whether they come from both Petty Officer School and Petty Officer Orientation Course or just the Petty Officer Orientation Course.

Other important system driving assumptions which are connected with assignment and retirement problems will be mentioned in the Program Specifications (Chapter IV).

B. FUNCTIONAL REQUIREMENTS

These requirements elucidate what the system must do from a user's viewpoint and also help to drive the system.

1. Operating Information System Objectives

These are the objectives of Operating Level Management and the Operation Personnel of the Personnel Bureau.

a. A good match should be provided between billets and personnel by filling the vacant billets with qualified personnel.

b. Under the current system, all personnel transfer in August. This means that all assignments are made in the period from January through April with only minor changes in the slate from May through August. The resulting

overload on assignment officers in the early part of the year tends to be counterproductive. It would be far more advantageous from the assignment point of view to spread the assignment process out over a longer period of time.

c. Top management must be informed periodically about current missions and must be asked for guidance.

d. Orders must be issued and delivered to concerned personnel when the final assignments and transfers have been approved by the top management.

e. Stability in personnel transfers must be fostered.

f. There must be a capability to respond to unusual vacancies which are created by separated, deceased or retired personnel, and to inform top management expeditiously.

g. Better service in general should be provided.

h. A capability to analyze future objectives in connection with the current system is desirable.

In addition to the preceding, the following objectives pertain:

i. To suggest additional features for future developments.

j. To decide the number of students which will enter the Petty Officer School and Petty Officer Orientation Course.

k. To provide the list of Petty Officer Orientation Course graduates.

2. Management Information System Objectives

These are the objectives of the top management level personnel of the Personnel Bureau.

a. The current system must meet the planned objectives.

b. Decreased cost.

- c. P_a : Actual Performance
 P_p : Planned Performance
 C_a : Actual Cost
 C_p : Planned Cost
 T_a : Actual Time
 T_p : Planned Time
 E_a : Actual Effort
 E_p : Planned Effort

To reach the level of:

$$P_a \gg P_p, C_a \ll C_p, T_a \ll T_p \quad \text{when } E_a = E_p$$

That is, the goal is to complete the project on or ahead of schedule; to do this requires that actual performance must equal or exceed planned performance; actual cost must be equal to or less than planned cost and actual time must be equal to or less than planned time when actual effort and planned effort are equal.

d. The controlled release of assignments, thus assuring all assignment slates are promulgated on the proper date.

e. If the current policies, e.g., maximum and minimum time limits for sea and shore billets, number of priority classes do not give the optimal solution, top management must attempt to identify a better policy to reach the optimal solution.

f. Data must be provided to statisticians for statistical reports.

g. Operating management level must be informed in advance of the personnel needs of new ships.

C. SYSTEM REQUIREMENTS

Input information which the system requires, the desired outputs, File Security and Process Control create the System Requirements. These are prepared according to the general statement of the problem.

1. Data Base

The data base will be examined in two parts. The first part will be the Personnel Characteristics File and the second part will be the Billet Requirements File.

a. Personnel Characteristics File

Each petty officer in the Navy will have a record in the Petty Officer Master File. The record will be 113 characters in length and will contain the petty officer's personal information, training situation, function information, language comprehension level, and his specialty.

b. Billet Requirements File

Each billet in the Navy will have a record in the Billet Master File. The record length will be 75 characters and will contain billet's priority, type, place, required rank, and courses to fill this billet and the basic information concerning the Petty Officer who still occupies this billet.

Since it is assumed that there is no key-to-tape recorder in the Naval Headquarters Computer Center, it is assumed that the data first will be punched into 80 column cards which will then be copied onto magnetic tape. In Appendices E1 through E4 Layout Forms for the input information is shown as it will appear on cards and tape for both the Petty Officer Master File and the Billet Master File.

More detailed information about the data base will be mentioned in Data Base Definition (Chapter V Section B).

2. Inputs

Input data will be limited to that necessary for creating, updating, modifying or changing the data base.

3. Outputs

There are five types of desired output formats:

a. Assignment Report Format

When a petty officer has been chosen by the machine as a candidate to a new billet, this format is used.

First, a general title will be printed followed by four additional lines. The second line states the necessary billet characteristics like billet's identification, priority, billet specification (sea/shore), unit, city, required profession and rank, and if this billet is occupied. If the billet is currently filled, the incumbent's registration number, name, and rank will be printed. If the billet is not already occupied by a petty officer, the registration number, name and rank will be blank. The fourth line states

the necessary characteristics of the new candidate, such as the candidate's registration number, name, rank, profession, and his old billet's identification, specification (sea/shore), unit and city. The first line and the third line are headings for the billet and petty officer data (see Appendix F1).

b. Promotion Report Format

This format will be used for obtaining the listing of the personnel who will be promoted to a specific rank in August.

First, two general title lines will be printed. The first line states the new rank and the second will be a heading line. Then one line will be printed for each petty officer, stating the promoted petty officer's registration number, name, old rank, profession, time which was spent in the old rank, promotion date, billet identification, billet specification (sea/shore) and location of the billet (see Appendix F2).

c. Retirement Report Format

This format will be used for obtaining the listing of personnel who will retire in August. First, two general title lines will be printed. The first line will be a description and the second will be a heading line. Then one line is printed for each petty officer which states the retiring petty officer's registration number, name, rank, profession, retirement date, time spent in present rank, billet identification, priority, billet specification, and location (see Appendix F3).

d. Billet Report of a Specific Unit Format

This format will be used for obtaining the listing of existing billets and corresponding personnel at a specific unit (a specific destroyer, submarine, shore base, etc.).

First, three general title lines will be printed. The first line will identify the unit. The second states the city of the unit, and the third is a heading line.

Then one line will be printed for each billet in that unit in order to identify if somebody already occupies this billet. If the billet is filled, the petty officer's registration number, name, rank, profession, and billet identification will be printed. If the billet is not filled by a petty officer, only billet identification, required profession, and occupation flag (see Chapter V Section B) will be printed (see Appendix F4).

e. Personnel Report for a Specific Profession Format

This format will be used for obtaining the listing of personnel who have the same specific profession (all radiomen in the Navy, all radarmen in the Navy, etc.). It also indicates the vacant billets in that profession.

First, two general title lines will be printed. The first line states the specific profession, and the second is a heading line. Then one line will be printed for each petty officer whose profession matches the one specified. The information provided includes the petty officer's registration number, name, rank, billet identification, priority, billet specification, unit, and city (see Appendix F5).

4. File Security

Whenever a system requires a file, then the file security problem must be considered. Because the recorded information on the file affects the entire system's working performance, any damage to the file will cause an insupportable loss of vital information. File security can be examined at two levels.

a. Physical Security

Physical security ensures that the files are not damaged or lost while waiting to be processed. This is the responsibility of the operations supervisor of the computer installation. Some functions related to the physical security are:

(1) The storage location should be constructed to help guard against fires.

The U. S. Air Force Statistical Office in the Pentagon once suffered the effects of a fire that damaged or destroyed three computers and more than 7000 reels of magnetic tape. The loss of magnetic tape alone, assuming a cost of \$40 per reel, is \$280,000. One expert estimates that the total loss in terms of data and the cost of reconstruction may have been as much as \$30 million.

The lesson of this fire is that vital records and documents should be stored in fireproof areas. If they are not so stored, they can be totally destroyed by fire.
[Ref. 4]

(2) The housing facilities should also have high resistance against water damage and dust.

(3) Temperature, air, and humidity must be controlled adequately.

(4) The operators should be instructed about the correct methods of handling the media. Tapes must be handled by their hubs.

The efficiency of computer tape performance is directly proportional to the degree of house-keeping and skill of operator's handling techniques, [Ref. 29].

(5) Paper notes should not be stored in the canister, because these paper notes can cause contamination due to shredding.

(6) Entry to the storage area should be restricted to the authorized personnel only.

(7) A number of medium-size and large installations have designated that a librarian control the access to information which is contained in the library.

Installations which do not fully utilize the librarian approach generally permit the operators to remove and replace data in the library. The problems encountered in the course of operating in this manner are, in many ways, similar to those sometimes found in a public library. A few of the common problems involve:

1. Misfiled data.
2. Data removed and not returned.
3. Incorrect data taken.
4. Important information destroyed.
5. Improper external identification. [Ref. 14]

(8) All tape cans and other containers must be labelled and indexed appropriately with non-shredding labels.

(9) The initiating documents must not be lost or destroyed.

b. Operational Security

Operational security ensures that data is not damaged and lost during operations. Cleanliness is very important for tapes. When loading and unloading, the tape should never be allowed to contact the operator's clothing or floor. When it is necessary to touch the surface of the tape, the operator should wear rubber gloves.

In spite of these safeguards, files do occasionally get damaged or the tape contents become unreadable. To overcome this problem, the "Grandfather-Father-Son" method will be used. With this file security technique, at least three versions of a file will be ready at any time (see Appendix G).

File 1 - Grandfather

File 2 - (Father) which was created from File 1.

File 3 - (Son) - current file - which was created from File 2 (see Appendix H).

Recovery is always possible with this technique. For example, if the new data on File 3 were found to be erroneous, the job should be repeated by using File 2 with the transactions. If both File 2 and File 3 were destroyed during machine operation, File 1 is ready for originating File 2, and then File 2 originating File 3. If File 3 is correct, it should be used as the Father File at the next step for creating the Son File. Management can establish as many generations of backup files as it feels is necessary to protect the data. In addition to these three files, one more Emergency File is duplicated from the Master File (see Appendix I). The purpose of this file would be to protect the data from disasters such as from fire or water damage.

All data changes in the Master File will be copied monthly to the Emergency File which will be kept in a fire-proof and water-proof vault in a special room. If for any reason the Grandfather tape is lost, the Father, Son, and Emergency files will be ready to use with the last month's

data. Also, all monthly changes to the data base have been maintained in the transaction records. With the assistance of these records, the Emergency File can be updated and can be used as a Grandfather File.

5. Process Control

During the execution of projects, matching the plans and actual operations poses a difficult problem. Therefore, positive control is necessary in order to reach the planned objective. "Good project control begins with the assignment of job responsibilities." [Ref. 28]

It is very important that the control system be simple and easy to use, so that it complements and does not impede the regular flow of work. A good control system must be able to answer these questions:

- a. Did we include all the information we should have?
- b. Did we translate the information from source records correctly?
- c. Are the source records correct?
- d. Have the data been processed throughout the system?

The control activity is composed of three steps:

- a. Setting the original standards of performance. These standards are the statement of conditions which will exist when the task is fulfilled adequately.
- b. Measuring the achievement against these standards.

The statement of measurements could be in three forms:

- (1) Personnel Observation. This form is the oldest and most general one. Its advantages are the

immediate action, direct contact, and direct observation of personnel, its disadvantages are insufficient measurement precision and the time consuming character of method.

(2) Oral Reports. This form gives good results from the measuring performance point of view, but does not leave any permanent record.

(3) Written Reports. This form leaves permanent records, so that the top management personnel can review these reports periodically.

c. Correcting deviations from standards. This step could be performed by reviewing the plan, examining the organization structure, improving training and clarifying any job-related misunderstandings.

One can find three levels of control in a DP system:

a. Overall control or top level control.

b. Management control which ensures that the project objectives are being met as the project progresses. Some functions of the management control are:

(1) Training and evaluation of the staff, control over individual work progress and making adjustments as required.

(2) Scheduling and monitoring the work of staff.

(3) Control over the file library.

c. Operational control which ensures that operational activities are carried out efficiently and effectively.

D. AVAILABLE DATA SOURCES

1. Personnel Data

Each petty officer in the Navy has a file at the Naval Personnel Bureau. This file is comprised of the petty officer's individual historical data, performance data, fitness reports, physical fitness reports, award and criminal records, annual duty preference reports, and commanding officers' comments and recommendations.

This information is updated by the annual personnel reports which come from the commanding officers of the units. Some information in the reports has been submitted by the personnel themselves controlled by the executive officer and then approved by the commanding officer of that unit.

2. Billets Data

Each unit in the Navy has a specific duty organization book which lists only the billets in that location. All specific information about the billets (e.g., priority, billet specification, unit, required profession, required rank, required languages, required courses, maximum and minimum time limits for the billet in a specific location) can be found in that book.

During the implementation phase only, the billet data forms will be filled in by each unit for the billets under its purview and will be sent to Naval Personnel Bureau for conversion into codes and creation of the data files. Once the billet files are created, the Personnel Bureau will perform the necessary subsequent updates (e.g.,

the name, rank, and registration number of the petty officer who currently occupies the billet) on the files after the final assignments are completed.

IV. PROGRAM SPECIFICATIONS

A. ASSIGNMENT POLICIES

1. Weight Factors

The weight factors which are taken into consideration for assigning petty officers to vacant billets are discussed in priority order in the following subparagraphs:

a. The candidate's profession should match the required profession of the vacant billet.

b. The candidate's rank should match the required rank of the vacant billet.

c. The language comprehension level of the candidate should match the required language comprehension level of the vacant billet.

d. The training level of the candidate should match the courses which are required for properly filling the vacant billet.

e. The candidate's current duty city should match the city of the vacant billet.

2. Vacancies

After the completion of personnel assignment process, some billets still will be vacant. These vacancies are:

a. Flexibility Vacancies

NOPO: Total number of petty officers in the Navy.

NOB: Total number of billets in the Navy.

FVC: Total number of flexibility vacancies in the Navy.

For every time, $NOB > NOPO$ must be satisfied.

$$FVC = NOB - NOPO$$

(FVC is decided by the Naval Personnel Bureau.)

This means that some billets will be left vacant during the assignment process. These vacancies have the following advantages:

(1) It gives flexibility to the personnel officer during the assignment process.

(2) It allows for planned personnel increases.

b. Lost Personnel Vacancies

Deceased and separated petty officers create unexpected vacancies.

c. Time Vacancies

This will include petty officers who are assigned to temporary duty or who are placed on sick leave for a specific period of time.

3. Special Personnel

Divers, skin divers, frogmen, UDT men, EOD men, hospital corpsmen, and Naval Air Force petty officers have been classified as special personnel. Also, the personnel having medical disabilities precluding sea duty are considered as special personnel. The assignments of the special personnel will be done manually since the number of petty officers and billets are limited and different specifications apply for each of these branches. Thus, it is expected that a manual assignment system will give more satisfactory results when assigning special personnel.

4. Newly Graduating Personnel

The first assignments of the newly graduating Leading Seamen from the Petty Officer Orientation Course will be done manually. All must be assigned to sea billets. This policy is strictly enforced by the top management.

5. Flow Problem

The structure and policies of the Turkish Navy simplifies the flow problem. The most important factors contributing to this simplification are the:

a. Ten years compulsory service mentioned in Systemic Assumptions (Chapter III Section A).

b. Execution of transfers, retirements, separations, and promotions on one date. To accomplish this policy, all personnel who are due to transfer or change status during August receive their orders in June or July.

6. Assumptions for Assignment Problem

a. Time Limits

For shore billets:

Minimum time: 1 year.

Maximum time: 2 years.

For sea billets:

Minimum time: 3 years.

Maximum time: 5 years.

b. Billet Rates

c_1 : Total number of shore billets in the Navy.

c_2 : Total number of sea billets in the Navy.

k_1 : Average period for a shore billet.

k_2 : Average period for a sea billet.

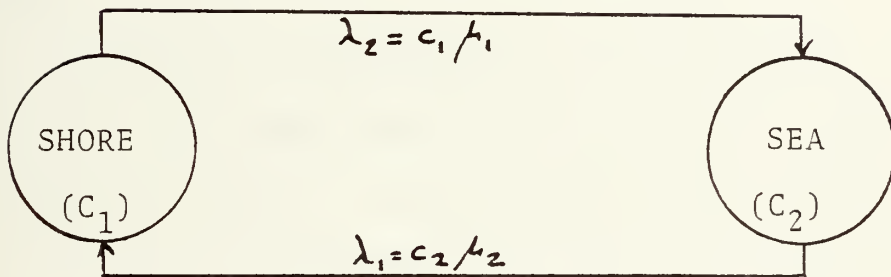
μ_1 : Transition rate through shore service.

μ_2 : Transition rate through sea service.

λ_1 : Number of petty officers who are assigned from sea billets to shore billets in one year.

λ_2 : Number of petty officers who are assigned from shore billets to sea billets in one year.

Arrival rate to sea billets



Arrival rate to shore billets

According to time limits, k_1 is assumed 1.5 years, and k_2 is assumed four years. So, the transition (service) rates:

$$\mu_1 = \frac{1}{k_1} = \frac{1}{1.5} ; \mu_2 = \frac{1}{k_2} = \frac{1}{4}$$

In the long run:

$$\lambda_2 = \lambda_1$$

$$c_1 \mu_1 = c_2 \mu_2$$

$$\frac{c_1}{c_2} = \frac{\mu_2}{\mu_1}$$

Then, the rate of shore billets to sea billets:

$$\frac{\text{Shore billets}}{\text{Sea billets}} = \frac{c_1}{c_2} = \frac{1/4}{1/1.5} = \frac{1.5}{4} = 0.375$$

B. RETIREMENT POLICIES

Every petty officer who reaches 25 years of service in the Navy has the right to retire. It should be noted that the active service period is 20 years; however, every petty officer is allocated an additional year of service credit for every four years of actual service, so 20 years can be counted as 25 years.

A petty officer who reaches his 25 years of service in the Navy fills in a Duty Continuation Form and sends it to Naval Personnel Bureau. On this form he indicates his preference to retire or to continue in service. In either case, the date on which he eventually expects to retire is specified.

If a petty officer has already accomplished his 25 years of service in the Navy, and:

1. He Wants to Retire

He will be retired in August. In fact, these petty officers can be retired any time they want with three months notice, but for standardization purposes, it is assumed that willing petty officers will be retired in August.

2. He Wants to Continue In Service

a. If he is less than 55 years of age, he can continue to serve.

b. If he has reached the age of 55, he has to retire in August even though he wants to stay in service.

V. GENERAL DESCRIPTION OF THE MODEL

A. GOAL OF THE MODEL

In general, the aims of this model in order of priority are:

1. To help the personnel officer by giving him a list of personnel who provide a good match to a specific job.
2. To reduce the time required for personnel assignment.
3. To obtain pertinent information on a rapid basis.
4. To fill the priority billets in descending sequence.
5. To assure that personnel are rotated in a timely fashion, so that they serve neither too long nor too short a tour of duty in any one location.
6. To give each petty officer an equitable mixture of sea duty and shore duty time.
7. To assign personnel to billets by considering their desires.

These goals are treated separately below.

1. A Better Match Between Billets and Personnel

There are about 10,000 petty officers in the Turkish Navy. Around thirty percent of these petty officers are assigned each year. But, the problem is to find the appropriate billets for the personnel. This represents a very time-consuming and tedious problem, since often more than one person may be eligible for a specific billet. So, the system will determine the personnel who are eligible for new

sea or new shore assignments, and then publish a listing of eligible persons for various billets. The Personnel Officer will pick one of them by looking at the "other requirements" for a specific billet.

2. To Reduce the Time Required for Personnel Assignment

To change the Manual Assignment System to Computerized Assignment System should provide a considerable time saving.

3. To Obtain Pertinent Information on a Rapid Basis

This might include the following listings:

- a. Personnel who are going to be promoted in August.
- b. Personnel who are going to retire in August.
- c. Personnel who are assigned to a specific unit.
- d. All petty officers who have a specific profession.
- e. All billets that are not occupied at the end of the assignment process.

4. Consideration of Personnel Preferences

Because of the social activities available when assigned to shore duty and the hardships of sea duty, it is normal that most of the personnel want to have shore duty. This is why the system will not make personnel assignments based on personal desires, but will let the Personnel Officer know who wants shore duty and who wants sea duty. The final decision will be made by the Personnel Officer.

5. Maximum and Minimum Time in Billets

Some of the personnel in the Navy can stay in the same billets for more than a maximum, or less than a minimum desirable time. If a Petty Officer exceeds the maximum

time limit in the same billet, he will stagnate in his job and not have the opportunity to learn more about new techniques and developments. The person will be bored by doing the same job for years and years, and his performance will gradually decrease. This will affect the whole unit and decrease its overall effectiveness. By the same token, if an individual is transferred too early, he will not have time to become effective in his work.

The system has been designed so that the time limits on sea duty will be three to five years and the time limits on shore duty will be one to two years. Decisions will be made according to the time limit ascribed to the billets.

6. Equity

Equitable treatment of personnel in the area of assignment to sea duty or shore duty is a necessity. Inequities in sea/shore assignments hurt morale. The model has been designed to assign personnel to sea if less than two-thirds of their total service time has been in sea billets. However, the personnel officer may have to make exceptions to ensure that all sea billets are sufficiently filled.

7. Priority Jobs First

Not all of the billets will have the same priority. It is desired to fill the highest priority billets first and then the others.

B. DATA BASE DEFINITION

There will be two distinct data bases which support the system. These are:

1. Data Base for Personnel

Each petty officer in the Navy will have a record in the Data Base, and this record will contain only that data which the Personnel Bureau needs to know from the assignment point of view. Inclusion of data elements that would simply be "nice to have" will be avoided. This record will be created on two punched cards for each person; the first card will contain 80 columns of data and the second card will contain 40 columns of data (see Appendix E1). The Petty Officer Master Tape will be 113 characters in length (see Appendix E2). The fields of the record and their lengths are explained below. Refer to appendices E1 and E2 for clarification of the following discussion:

PA: Registration No. (7 characters)

The first two characters will designate the last two digits of the year in which the person graduated from the Petty Officer Orientation Course, and the last five characters will be the classification number in the class according to his grades.

PB: Name (29 characters)

The order will be first name, middle initial, and last name.

PC: Rank (1 character)

Each rank will be represented by a number from 1 to 6:

- 1 corresponds to Leading Seaman
- 2 corresponds to Leading Seaman (Senior)
- 3 corresponds to Master Seaman
- 4 corresponds to Petty Officer 2nd Class
- 5 corresponds to Petty Officer 1st Class
- 6 corresponds to Chief Petty Officer 2nd Class

PD: Profession (3 characters)

This field will designate if the person is an electrician, gunner, navigator, etc.. Appropriate abbreviations will be used for each profession.

PE: Date of Birth (6 characters)

There will be three subfields and each of them will contain two characters. The order of the subfields will be as follows: year, month, day.

PF: Marital Status (1 character)

S corresponds to single;

M corresponds to married.

PG: Number of Children (1 character)

PH: Courses (10 characters)

The last or longest five courses will be recorded. There will be five subfields and each course will be represented by two letters. Only training periods longer than two weeks in duration will be considered courses.

PI: Language Comprehension Level (10 characters)

There will be five subfields and each language will be represented by a letter. The following number will indicate the comprehension level of the petty officer (e.g., E8 shows that a petty officer knows English and his comprehension level is eight). Comprehension levels will range from zero through nine; level nine will be the excellent level.

PJ: Time in Present Rank (1 character)

This field indicates the years of service in the current rank.

PK: Next Promotion Date (2 characters)

This field shows the last two digits of the year which the petty officer will be promoted to the next rank. Recording month and day is unnecessary, since all eligible personnel are promoted during August.

PL: Default Category (1 character)

This field designates the petty officer's lost years in his current rank. If a petty officer's average fitness report grade is unsatisfactory, he loses one year. If, during the next year, he fails again to meet the minimum standards, he loses two years and so forth. A field value of 0-5 corresponds to zero through five years lost. If the field value is greater than 5, the petty officer must be discharged from the Navy.

PM: Time at Sea (2 characters)

This field will indicate how many years of sea duty a petty officer has had up until the present year.

PN: Time at Shore (2 characters)

This field will indicate how many years of shore duty a petty officer has had up until the present year.

PO: Average Fitness Report Grade (3 characters)

Each petty officer will have a fitness report grade recorded each year. The scale will range from zero to 100.

PP: Duty Preference (1 character)

The personal desires will be considered by the Personnel Officer in making the final decision. In this field, an individual's desire is shown for a shore duty or for a

sea duty. The unit and city will not be considered. Code values are:

- 0 corresponds to sea billet;
- 1 corresponds to shore billet.

PQ: Loss Flag (1 character)

The records of the deceased, retired, separated personnel will be kept in the file for one year. At the end of one year, the records of these personnel will be removed from the data base. Code values are:

- 0 corresponds to "Still in Service;"
- 1 corresponds to "Not in Service."

PR: Reason of Loss (1 character)

This field shows the reason of not being in the service. Code values are:

- 0 corresponds to Retired Petty Officer.
- 1 corresponds to Separated Petty Officer.
- 2 corresponds to Deceased Petty Officer.

PS: Destruction Date of Record (2 characters)

This field shows the removal date of the record from the data base for the petty officers who are no longer in the service.

PT: Retirement Date (2 characters)

The codes are identical to the PK field.

PU: Sea Eligibility Flag (1 character)

This field indicates that either a petty officer is eligible for sea or not according to the Decision Logic Tables. Code values are:

0 corresponds to "Eligible for Sea."

1 corresponds to "Not Eligible for Sea."

PV: Shore Eligibility Flag (1 character)

Counterpart of PU for shore.

PW: Transfer Flag (1 character)

If a person has already been assigned to a new billet by the personnel officer, he is ineligible for nomination for another billet. This field will protect the personnel from reassignment. When a petty officer is assigned to a new billet, the transfer flag will be changed to "1" in the same day.

PX: Promote Flag (1 character)

This field indicates whether a petty officer is scheduled for promotion during the year.

PY: Promotion Date (2 characters)

Indicates the year in which the petty officer was promoted to his current rank.

PZ: Billet Identification (5 characters)

Each billet will be represented by a 5 digit number.

RA: Time-on-Station (6 characters)

The Petty Officer's duty starting date in his current duty station.

RB: Maximum Time in Billet (1 character)

For a shore billet, the value is 2. For a sea billet, the value is 5.

RC: Minimum Time in Billet (1 character)

For a shore billet, the value is 1. For a sea billet, the value is 3.

RD: Type of Present Duty (1 character)

This field will indicate if the petty officer is assigned to sea duty, shore duty or special duty. Code values are:

0 corresponds to Sea Duty.

1 corresponds to Shore Duty.

2 corresponds to Special Duty.

RE: Specialty Designator (1 character)

This field will designate if the person is a submariner, aviator, specialist on a particular subject or a surface sailor. The reason for separating surface sailors and submariners from each other is because a surface sailor cannot have duty on a submarine and vice versa.

RF: Unit (3 characters)

This field will designate the duty station. Each duty station will be represented by a 3 digit number.

RG: City (3 characters)

This field will show the geographical location of the duty station. Appropriate three letter codes will represent each city or area.

2. Data Base for Billets

Each billet in the Navy will have a record. Each billet's record will be created by one card. This card will contain 75 columns of data (see Appendix E3). Also the Billet Master Tape record length will be 75 characters (see Appendix E4). The fields in the record are explained below. Refer to Appendices E3 and E4 for clarification of the following discussion.

BA: Billet Identification (5 characters)

Each billet will be identified by a 5 digit number.

BB: Priority (1 character)

Each billet has a priority which is represented by a one digit number. For this model, only two types of priority are assumed.

BC: Type of Billet (1 character)

This field will show if the billet is a sea billet, shore billet or a special billet. Code values are identical to those of the RD field of the personnel record.

BD: Required Specialty (1 character)

This field will designate the specialty required to fill the billet (e.g., surface sailor, aviator, submariner).

BE: Maximum Time in Billet (1 character)

BE is identical to RB which has been previously defined in the Personnel Data Base.

BF: Minimum Time in Billet (1 character)

BF is identical to RC which has been previously defined in the Personnel Data Base.

BG: Unit (3 characters)

This field will designate the duty station where the billet is assigned.

BH: City (3 characters)

BH is identical to RG which has been previously defined in the Personnel Data Base.

BI: Required Rank (2 characters)

Most of the billets in the Navy can be filled by a petty officer of a certain rank or one of two adjoining ranks.

This field shows the required rank or ranks which satisfy the billet. The rank codes are identical to those of the PC field in the Personnel Data Base.

BJ: Required Profession (3 characters)

This field indicates the required profession for the billet.

BK: Required Languages (6 characters)

This field indicates the required languages and the respective comprehension levels for the billet. It is assumed that one billet requires at most, three languages. Language codes are identical to those of the PI field in the Personnel Data Base.

BL: Required Courses (10 characters)

The personnel must take certain courses to perform a specific job. This field indicates the courses required for the billet. Each of them will be represented by two characters.

BM: Occupational Flag (1 character)

This field will show if the billet is vacant or occupied. This field is required to identify all the billets which are empty at the end of the personnel assignment process and to make plans for future personnel requirements.

BN: Registration Number (7 characters)

This field contains the registration number of the petty officer who currently occupies the billet. The field will be blank if the billet has not been filled.

BO: Name (29 characters)

The name of the petty officer who currently occupies the billet.

BP: Rank (1 character)

The rank of the incumbent petty officer.

C. MODEL STRUCTURE

The model consists of a main program and five subroutines. The functions of the main program and the subroutines are as follows:

1. Main Program

The main program determines the desired program type and calls the appropriate subroutine. As soon as the execution of the subroutine ends, the main program terminates.

2. Subroutine ASSIGN

This routine accepts a billet identification, then reads that billet's requirements from the Billet Master File, and according to these requirements, scans the entire Petty Officer Data Base by checking each petty officer's eligibility flags and profession. It places all petty officers whose eligibility flags and professions match this billet into a separate array. Then it scans this array checking each petty officer's rank and takes all petty officers whose rank matches the billet and places them into second array. This processing continues, checking in turn, the petty officer's Language Comprehension Level, Courses and their current duty station cities. Finally, it produces a list of candidates for each billet. When the number of candidates for a billet reaches ten, no more candidates are considered for this billet; when a petty officer becomes a candidate for five billets, he is not considered for any other billets during that processing cycle.

3. Subroutine PROMOTE

This routine reads a specific rank, scans the Petty Officer Data Base, and produces the list of petty officers who will be promoted to the next rank from this specific rank in August. It also updates the promotion date of the petty officers who are in a default category.

4. Subroutine RETIRE

This routine scans the Petty Officer Data Base and produces the list of petty officers who will retire in August.

5. Subroutine UNITS

This routine scans the Billet Data Base and produces the list of billets which are assigned to a specific unit. It also identifies the petty officers who are occupying these billets.

6. Subroutine PROFESSION

This routine scans the Billet Data Base and produces the list of billets which are related to that profession. It also identifies the petty officers who are occupying these billets.

D. DETAILED MODEL DESCRIPTION

This section explains the routines in a detailed manner. The flowcharts of the routines are included in the Appendices K1 through K6. For the declarations which are used in the flowcharts, refer to Appendix J. In Appendix J, all declarations are explained in an alphabetical order.

1. Main Program

The Main Program reads and interprets the program type to determine whether it is an assignment program or a special type program. If it is an assignment program, the Main Program calls ASSIGN, otherwise it calls a special routine as follows:

- a. For promotions, the PROMOTE routine.
- b. For retirements, the RETIRE routine.
- c. For specific unit's billets information, the UNITS routine.
- d. For a "billet which relates to a specific profession," the PROFESSION routine.

Once the subroutine has completed processing, the Main Program terminates. (For the flowchart of the routine, see Appendix K1).

2. ASSIGN

Prior to using this subroutine, two decision logic tables must have already been used on the Petty Officer Master File. The first decision logic table checks the individual's eligibility according to the petty officer's current duty type and the time he has served in that current duty. This decision logic table produces one of three possible results (see Appendix L):

- a. He is not eligible for assignment; or,
- b. The Personnel Officer has to decide his situation;
or,
- c. He absolutely must be transferred to another billet.

The second decision logic table checks the eligible petty officer to find out whether he is eligible for a sea billet or for a shore billet according to his duty preference, the time he has served at sea, his last duty assignment, and his retirement date. This decision logic table produces one of three possible results (see Appendix M):

- a. He is eligible for a sea billet; or,
- b. He is eligible for a shore billet; or,
- c. The Personnel Officer must decide the assignment.

The result of the second decision table updates both the Sea Eligibility Flag (PU) and the Shore Eligibility Flag (PV) in the Petty Officer Master File.

The ASSIGN routine reads a billet identification from a job set-up card and then reads the billet's requirements from the Billet Master File. It then reads the Petty Officer Master File and selects each petty officer who meets the following criteria:

- a. The petty officer must be in the service.
- b. For a shore billet, the petty officer must be eligible for shore billets and for a sea billet, the petty officer must be eligible for sea billets.
- c. The petty officer may not be eligible for both sea and shore billets.

The remaining five steps of the subroutine consist of filtering the selected petty officers according to the following Weighting Factors checked in the order listed:

- a. Profession
- b. Rank
- c. Language Comprehension Level

- d. Courses
- e. City

At the first step, each petty officer's profession is checked. If it matches the required profession for the specific billet, the subroutine includes this petty officer in the Profession (P) array. At the conclusion of this stage, all petty officers have been scanned and filtered to the P array.

If the P array is empty, it means nobody's profession matched the required profession, and the Personnel Officer's help will be required.

In the second step, the routine is only interested in the petty officers who are in the P array. It checks all these petty officers' ranks against the required ranks of the billet and enters all matching petty officers into the Profession and Rank (PR) array. At the end of this stage, all the petty officers in the P array have been scanned and filtered to the PR array.

If the PR array is empty, the routine prints the P array to help the Personnel Officer. In the third, step, the routine is only interested in the petty officers who are in the PR array. It checks all these petty officers' Language Comprehension Levels against the required Language Comprehension Level of the billet and enters all matching petty officers into the Profession and Rank and Language Comprehension Level (PRL) array. At the end of this stage, all the petty officers in the PR array have been scanned and filtered into the PRL array.

If the PRL array is empty, the routine prints the PR array to help the personnel officer. In the fourth step, the routine is interested only in the petty officers who are in the PRL array. It checks all these petty officers' courses against the required courses for this specific billet and enters all matching petty officers into the Profession and Rank and Language Comprehension Level and Courses (PRLC) array. At the end of this stage, all the petty officers in the PRL array have been scanned and filtered into the PRLC array. If the PRLC array is empty, the routine prints the PRL array to help the personnel officer. In the final step, the routine is interested only in the petty officers who are in the PRLC array. It checks all of these petty officers' current billet cities, against the specific billet's city, and enters the first ten matching petty officers to the FINAL array. The city check is not critical, but it may reduce the number of physical moves. The PRLC array will also be very helpful to the personnel officer.

The final step terminates either after finding ten candidates for this specific billet or, if there are less than ten candidates for this billet, after scanning all the petty officers in the PRLC array. If the FINAL array is empty, the routine prints the PRLC array to help the personnel officer. Otherwise, it prints the FINAL array for this billet, reads a new billet identification number and repeats the entire process for this new billet. After the last billet's processing, the routine terminates. (For the flowchart of the routine, see Appendix K2).

Initially, it is proposed that the assignment process involve 50 billets a day with a maximum of ten candidates to be selected for each billet. Experience may prove that more than 50 billets may be feasible, but this number appears reasonable as a starting point. A petty officer can be a candidate for a maximum of five billets, and for each of them, the previous billet's identification would be shown on the output.

Example: The Chief Petty Officer, A. TURK, is selected as a candidate for three billets. Billet identification numbers are 00121, 03342, and 04565. On the Assignment Report someone will be able to see:

BILLET
ID
00121

THIS ASSIGNMENT IS 1ST ASSIGNMENT.
PREVIOUS ASSIGNMENT WAS 00000.

BILLET
ID
03342

THIS ASSIGNMENT IS 2ND ASSIGNMENT.
PREVIOUS ASSIGNMENT WAS 00121.

BILLET
ID
04565

THIS ASSIGNMENT IS 3RD ASSIGNMENT.
PREVIOUS ASSIGNMENT WAS 03342.

At the end of the day, the personnel officer will assign one petty officer to each of these 50 billets from the daily list,

and the records of these petty officers will be updated, and the Transfer Flags (PW) of these petty officers will be changed to 1. The next day another 50 billets will be processed in the same manner.

3. PROMOTE

The PROMOTE subroutine reads the promotion date and present rank from a job set-up card. It sorts the Petty Officer Master File according to promotion flags and next promotion dates. It calculates the new rank.

It processes each petty officer whose rank and next promotion date match those of the job set-up card. When the subroutine encounters a petty officer whose next promotion date is greater than the one from the job set-up card, the routine terminates.

The subroutine updates each selected petty officer record, based on his default category, as follows. If the default category is zero, the petty officer is identified as a candidate for promotion and his data will be printed in the specified format. If the default category is greater than zero, but less than six, the default category is added to the next promotion date and set to zero, and the updated next promotion date is printed as a reminder to the personnel officer. If the default category is greater than five, a special status message is printed for the petty officer. (For the flowchart of the routine, see Appendix K3).

4. RETIRE

The RETIRE subroutine reads a retirement date from a job set-up card. The subroutine reads the Petty Officer

Master File and selects each petty officer whose retirement date matches that on the job set-up card for processing.

For each selected petty officer who desires to retire or is older than 55 years of age, the subroutine prints his data in the specified format for retirement. Otherwise, it scans the next petty officer record. (For the flowchart of the routine, see Appendix K4).

5. UNITS

The UNITS subroutine reads a unit identification from a job set-up card. It reads the Billet Master File and selects each billet for which the unit matches the desired unit. For each selected billet, the subroutine prints the billet information, and if the billet's occupation flag is set, it also prints the incumbent petty officer's data.

When every billet in one unit is processed, the subroutine attempts to read a new job set-up card and repeat the above process. When all the cards have been read, the subroutine terminates. (For the flowchart of the routine, see Appendix K5).

6. PROFESSION

The PROFESSION subroutine reads a profession from a job set-up card. It then reads the Billet Master File and selects the billet records in which the profession matches the desired profession. For each selected billet, the subroutine prints the billet information, and if the billet's occupation flag is set, it also prints the incumbent petty officer's data.

When every billet that requires the desired profession in the unit is processed, the subroutine will attempt to read a new job set-up card and repeat the above process. When all job cards have been read, the subroutine terminates. (For the flowchart of the routine, see Appendix K6).

VI. MIS IMPLEMENTATION PLANS

Up to this point, this thesis has concentrated on theoretical specifications for a system. It is now appropriate to consider how the theoretical specifications may be implemented in a practical working system. "Implementation is the 'Moment of Truth' for all plans," [Ref. 3].

In the Implementation Phase, the logical order of the tasks and the steps of each task should be determined. This is called Task Analysis. For a good Task Analysis:

1. The tasks should be defined.
2. The order of the tasks must be determined.
3. If it is necessary to perform two or more jobs at the same time, the period of these jobs should be determined.
4. The status of a job must be determined.

All of these criteria are met by or incorporated into the Critical Path Method (CPM). The advantages of this method are:

1. The logical order of the tasks is indicated.
2. It functions as a project control device, thus helping to measure performance.
3. It acts as a "red flag" to identify difficulties as they arise, thus enabling the project manager to take quick corrective action.
4. It assists in scheduling the project.

The network table which contains activities, descriptions and estimated durations, respectively, is explained below (for the network diagram, see Appendix N):

- (S,1): Review of thesis by the Head of Personnel
(2 months)
- (1,2): Necessary policy modifications on the model.
(2 months)
- (2.3): Review and confirmation of policy modifications by the Head of Personnel.
(3 weeks)
- (3,4): Assignment of user personnel and structuring user relationships in a project organization.
(1 month)
- (4.5): Establish a training program.
(3 weeks)
- (5.6): Formal training of operating personnel.
(2 months)
- (6,7) Dummy activity.
(0)
- (3.7) Determination of and ordering of additional equipment (as required).
(1 month)
- (7.16): Training of user personnel on new equipment.
(3 weeks)
- (3.8): Review design specifications.
(2 months)
- (8,9): Problem analysis and logical analysis.
(3 months)

- (9,10): Flowcharting.
(1 month)
- (10,11): Block diagramming.
(3 weeks)
- (11,12): Desk-checking
(3 weeks)
- (12,13): Logic review by the project leader.
(2 weeks)
- (13,16): Program coding, testing and debugging.
(4 months)
- (3,14): Design of new forms for data collection.
(6 weeks)
- (14,15): Data collection.
(5 months)
- (15,16): Data conversion (for improving accuracy in data conversion operation documents must be proof-read by a second operator).
(3 months)
- (16,17): Preparation of punching documents.
(2 months)
- (17,18): Punching and verification.
(2 months)
- (18,19): Sorting and listing.
(3 weeks)
- (19,20): Edit listing.
(6 weeks)
- (20,21): Punch and verify corrections.
(6 weeks)

(21,F): Set up Master File on magnetic tape.

(2 weeks)

(3,F): Preparation of documentation.

(14 weeks)

The estimated duration rates which are used in the programming phase of the network table are calculated according to the rates of:

Designing Program Logic	33%
Coding	20%
Testing and Debugging	33%
Documenting	14%

Path S, 1, 2, 3, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21, F is the Critical Path (the longest path from the starting to the end of the project) under normal conditions; the project can be completed within 25 months.

VII. CONCLUSIONS AND RECOMMENDATIONS

The assignment model developed in this thesis can provide the Personnel Officer with increased information, thus enabling him to make a greater number of assignments in a more effective fashion than is possible with the manual method. In addition to the advantages which were previously described in Chapter 1, the Personnel Officer can also use this assignment model as a tool to help solve assignment problems.

The concept of the computer-assisted assignment system does not mean complete automation. It appears that the most effective assignment decisions require the use of both man and machine, reserving certain tasks to the man while relegating others to the machine.

It is recommended that the Turkish Naval Personnel Bureau consider utilizing this model to assign petty officers to specific billets. Perhaps an initial step could be to devise a test of the system involving a pilot group of Turkish Naval Petty Officers. If the experiment is a success, the experiment could be expanded to include larger segments until all Petty Officers were included. The author is firmly convinced that the experiment would be successful and that the Turkish Navy would receive great benefit from the inauguration of such a computer-assisted assignment system.

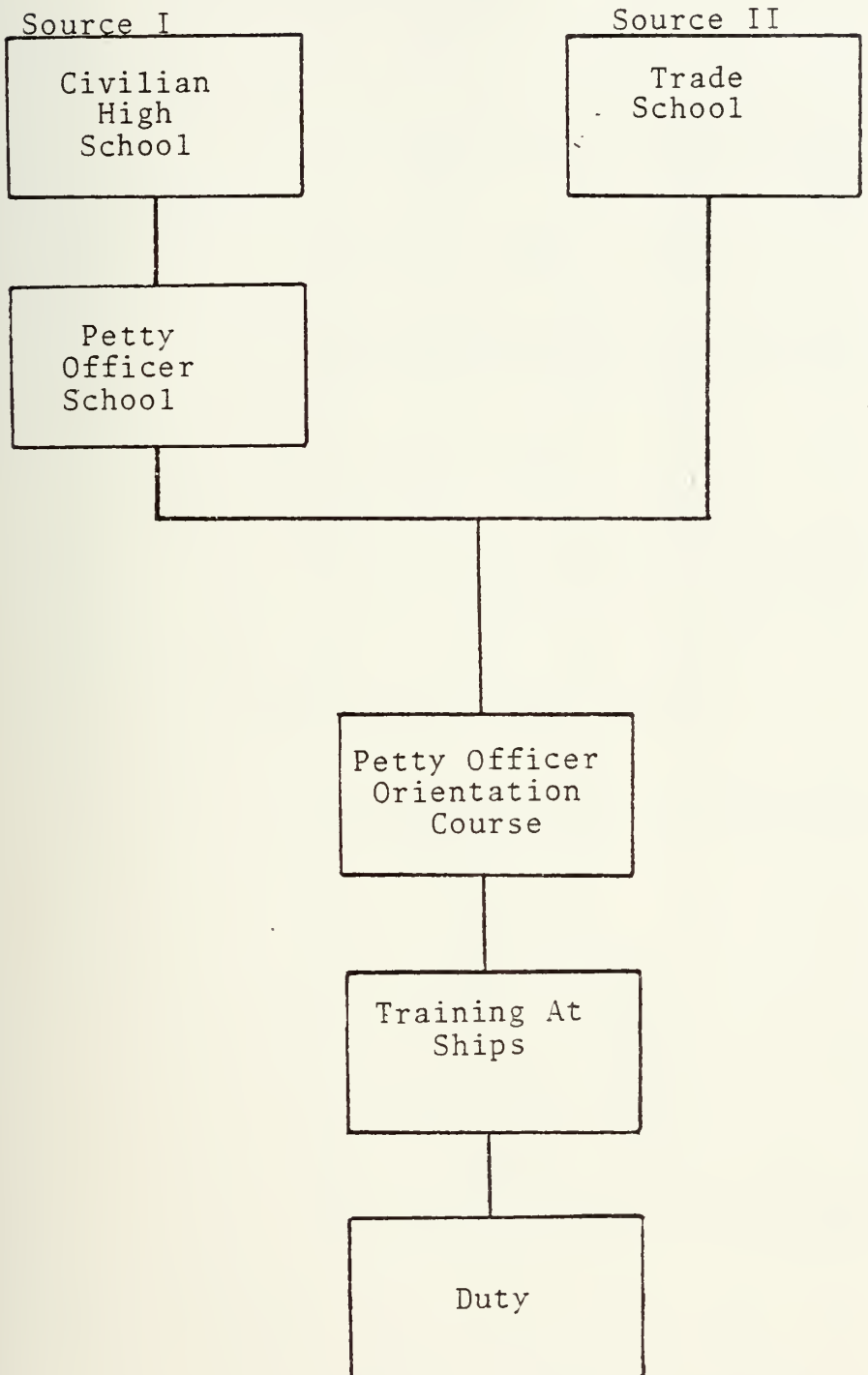
APPENDIX A: OFFICER SOURCES

SOURCE	ENTRY TO SOURCE	YEARS IN SOURCE	HIGHEST RANK	PERSONNEL RATE
Naval College and Naval Academy	NC - Exam NA - a. Direct entry from NC b. Exam	NC - 3 years NA - 4 years	---	95%
Civilian University	Exam	Up to university	Rear Admiral	4%
Petty Officers	Petty Officer	Petty Officer 2nd Class	Lieutenant	1%

APPENDIX B: PETTY OFFICER SOURCES

SOURCES	ENTRY TO SOURCE	YEARS IN SOURCE
Petty Officer School and Petty Officer Orientation Course	POS: Exam POOC: Direct entry from POS	POS: 2 years POOC: 2/3 year (8 months)
Petty Officer Orientation Course	Trade School Graduation and Exam	Trade School: 3 years POOC: 2/3 year

APPENDIX C: TRAINING ORGANIZATION FOR PETTY OFFICERS



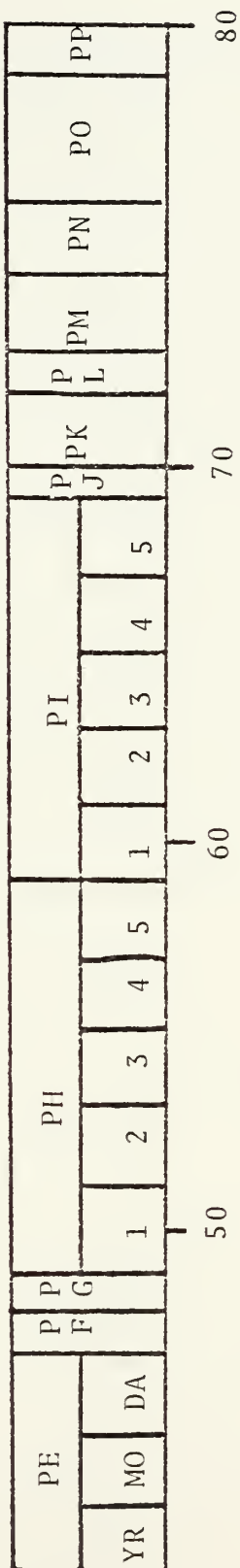
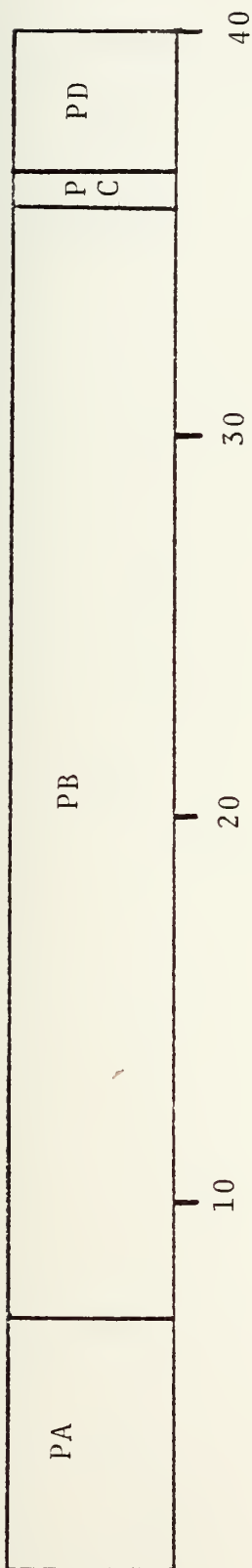
APPENDIX D

DECISION LOGIC TABLE FOR 2 YEARS MILITARY SERVICE

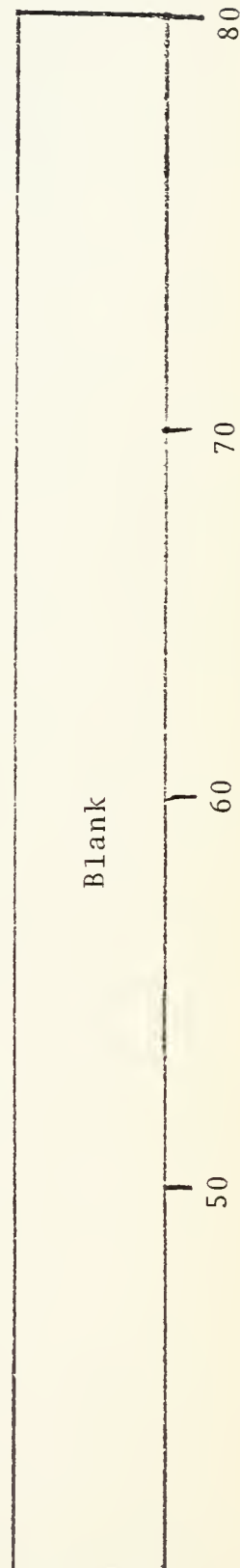
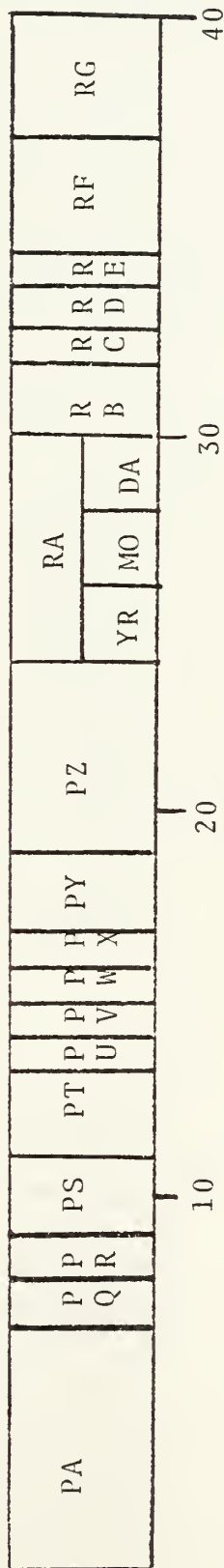
	1	2	3
Age \geq 20	Yes	Yes	Yes
Still training at school?	No	No	Yes
Graduated from university?	No	Yes	No
Wait			X
Supplementary Officer		X	
Conscript	X		

APPENDIX E1: PETTY OFFICER MASTER CARD FORMAT

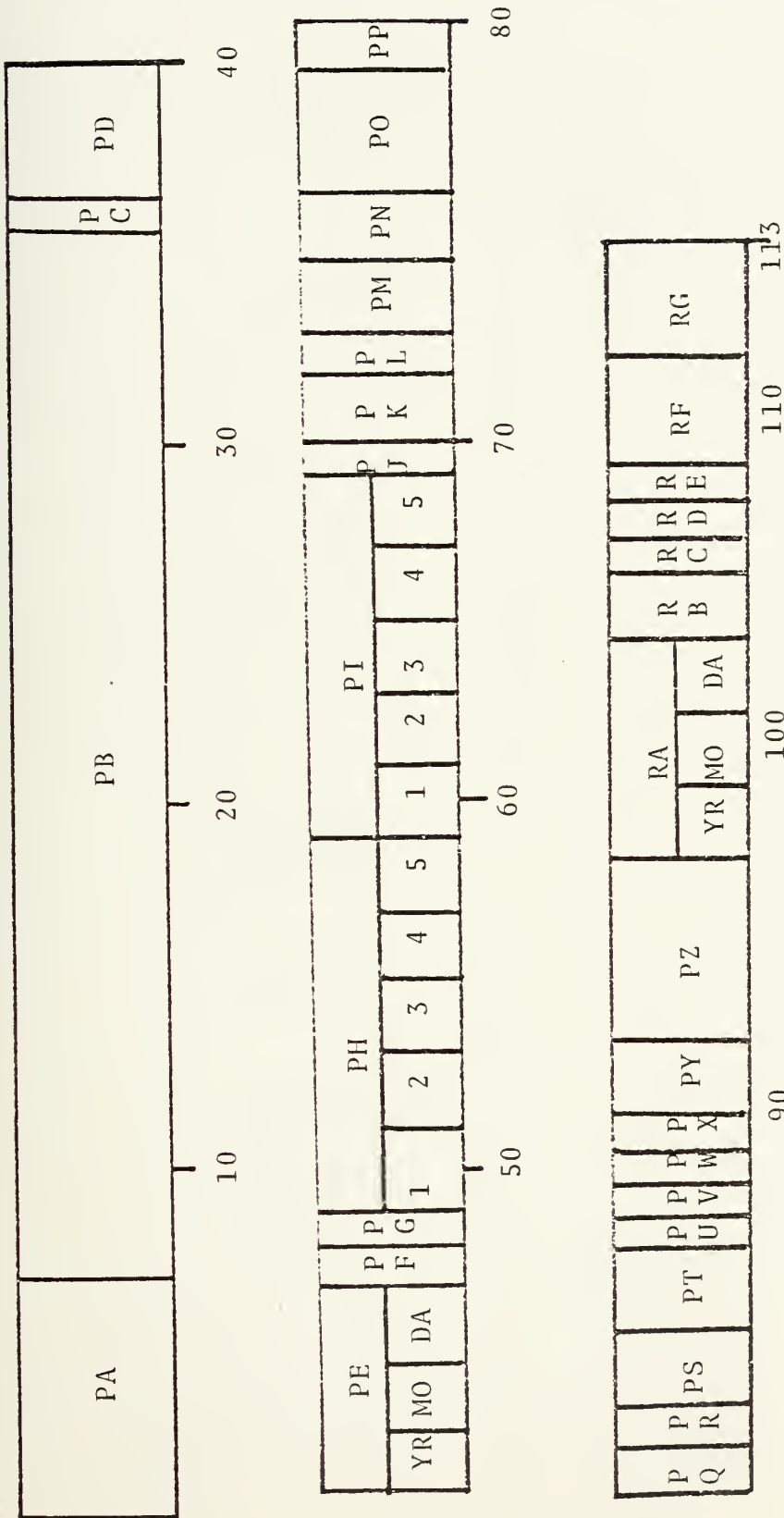
1st CARD



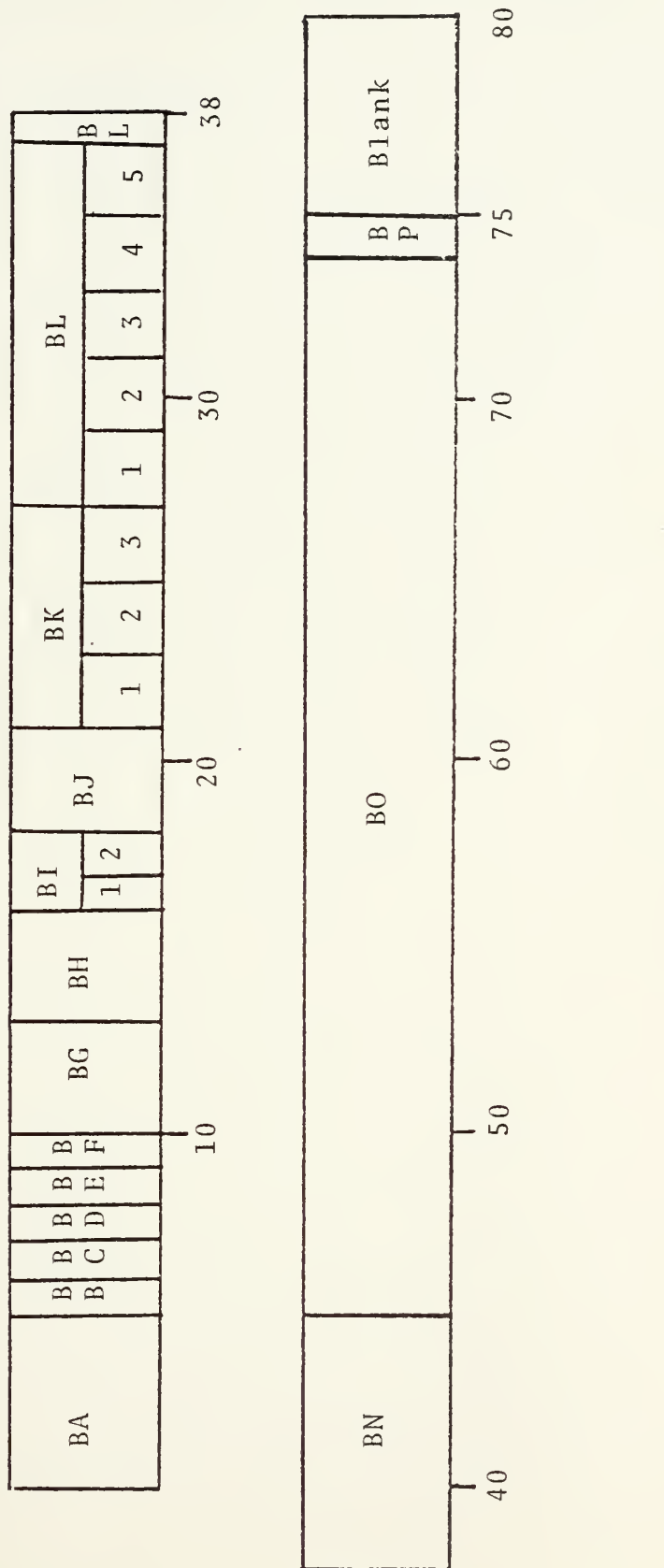
2nd CARD



APPENDIX E2: PETTY OFFICER MASTER
TAPE FORMAT



APPENDIX E3: BILLET MASTER CARD FORMAT



APPENDIX F1: OUTPUT FORMAT FOR ASSIGNMENT REPORT

ASSIGNMENT REPORT

BILLET ID	PRIORITY	SEA/SHR	SUR/SUB	UNIT	CITY	PROFESSION	REQUESTED RANK	OCCUPATION FLAG	REGISTRATION NUMBER	NAME (FIRST, MIDDLE, LAST)	PRESENT RANK
XXXXX	X	X	X	XXX	XXX	XXX	X/X	X	XXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	X
REGISTRATION NUMBER	XXXXXX	NAME (FIRST, MIDDLE, LAST)		PRESENT RANK	PROFESSION	BILLET ID	SEA/SHR	SUR/SUB	UNIT	CITY	
XXXXXX	XXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX		X	XXX	XXXXX	X	X	XXX	XXX	XXX

THIS ASSIGNMENT IS XTH ASSIGNMENT. PREVIOUS ASSIGNMENT WAS XXXX.

APPENDIX F2: OUTPUT FORMAT FOR PROMOTION REPORT

```

PROMOTION REPORT ( TO EX RANK )

REGISTRATION NUMBER          NAME(FIRST,MIDDLE, LAST)  PRESENT RANK  PRESENT PROFESSION  TIME IN PRESENT RANK  NEXT PROMOTION DATE  BILLET ID  SEA/SHR  SUR/SUB  UNIT
XXXXXXXXX                    XXXXXXXXXXXXXXXXXXXXXXXX  X              XXXX              X          XX          XXXXX  X      X      X      XXX

```

APPENDIX F3: OUTPUT FORMAT FOR RETIREMENT REPORT

RETIREMENT REPORT

REGISTRATION	NAME(FIRST,MIDDLE, LAST)	PRESENT RANK	PROFESSION	RETIREMENT DATE	TIME IN PRESENT RANK	BILLET ID	PRIORITY	SEA/SHR	SUR/SUB	UNIT
NUMBER	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	X	XXX	XX	X	XXXXX	X	X	X	XXX
XXXXXX										

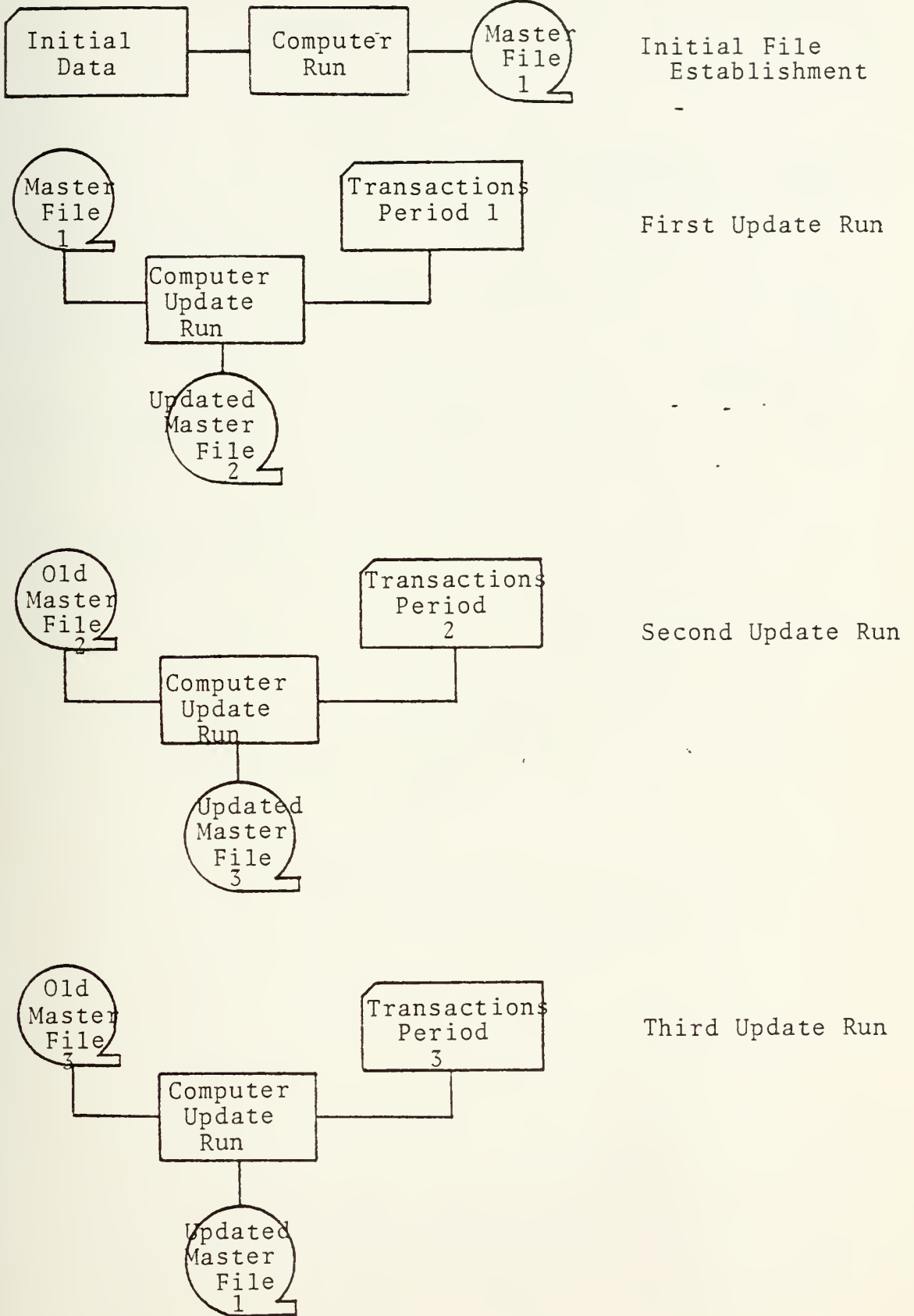
APPENDIX F5: OUTPUT FORMAT FOR A SPECIFIC PROFESSION

PROFESSION : XXX

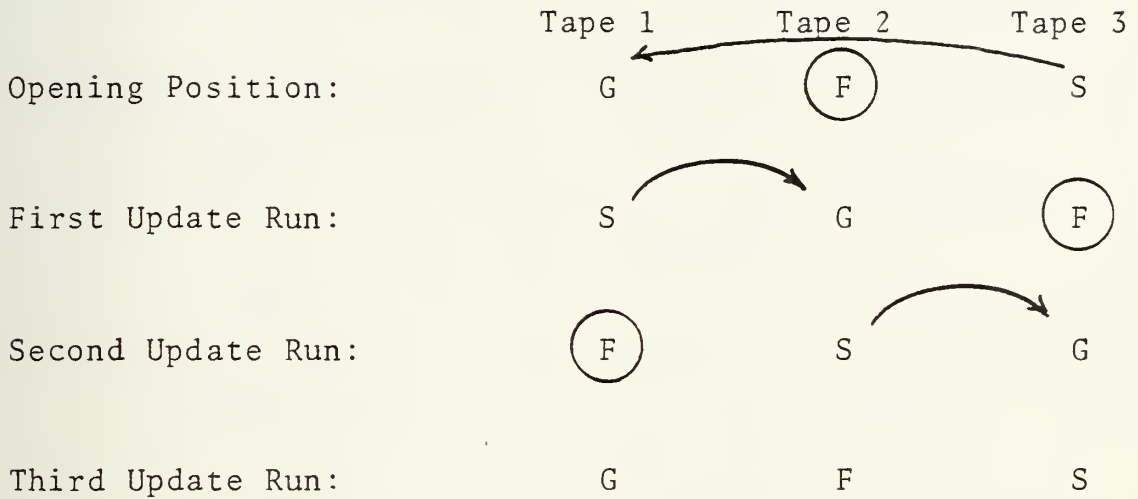
REGISTRATION NUMBER XXXXXXX	NAME(FIRST,MIDDLE,LAST) XXXXXXXXXXXXXXXXXXXXXXXXXX	PRESENT RANK X	BILLET ID XXXXX	PRIORITY X	SEA/ SHR X	SUR/ SUB X	UNIT XXX	CITY XXX
-----------------------------------	---	----------------------	-----------------------	---------------	------------------	------------------	-------------	-------------

APPENDIX G

"AN ILLUSTRATION OF THE GRANDFATHER-FATHER-SON FILE BACKUP PROCEDURE" [Ref. 4]



APPENDIX H: "GENERATION OF FILES FOR SECURITY" [Ref. 7]



---cycle repeats---

F = not used in update

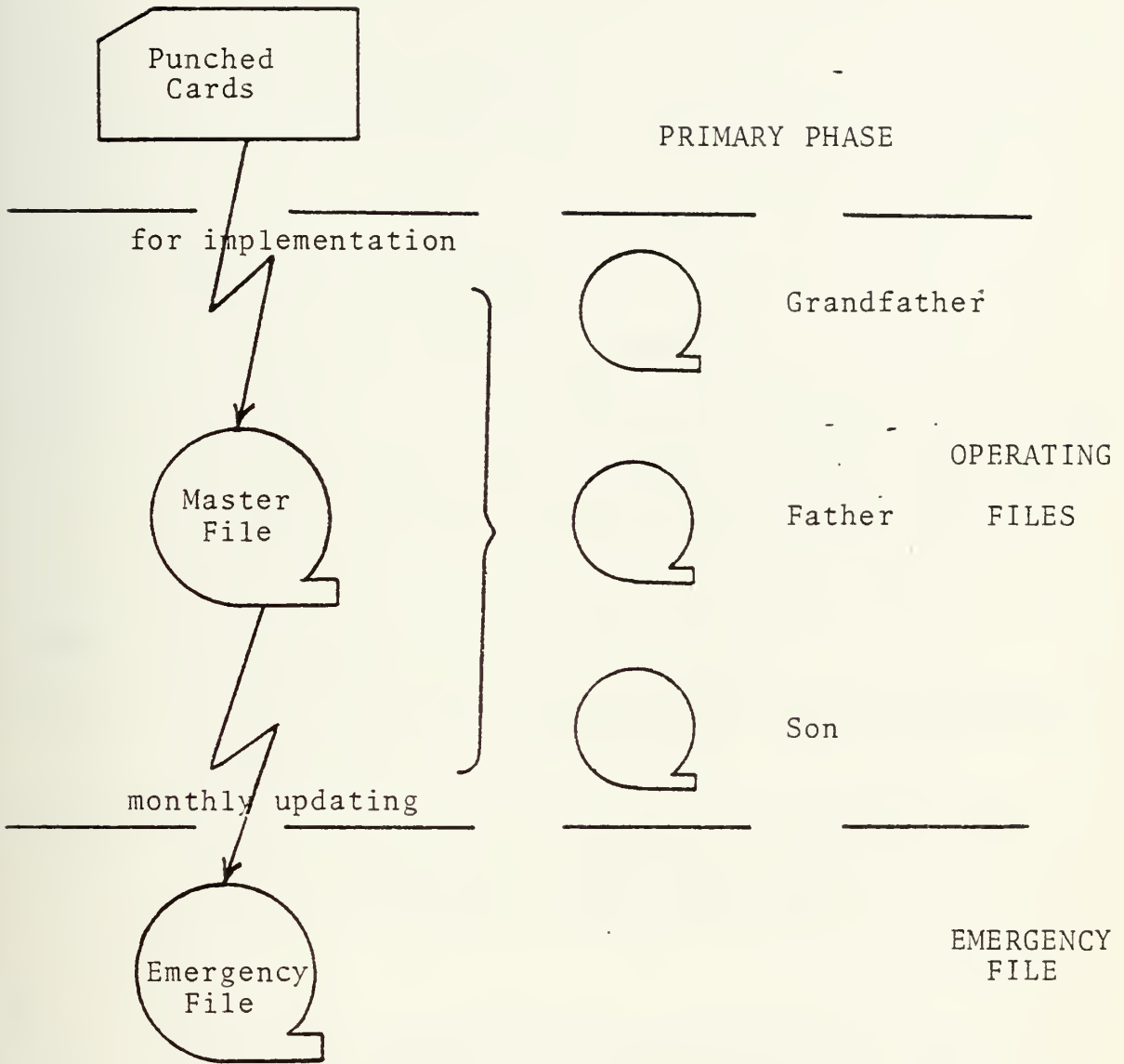
G = grandfather

F = father

S = son

↩ direction of transfer

APPENDIX I: SYSTEMATIC DIAGRAM OF FILES



APPENDIX J: DECLARATION DICTIONARY

A

AGE : Age of petty officer.

B

BCITY : The city of billet.

BID : Billet identification number

BIDS : An array for the ASSIGN routine which contains the billet identification numbers to which the petty officer currently being processed has been nominated.

BIRTH : Year of birth.

BTYPE : Type of billet. Corresponds to BC in Data Base Definition.

BUNIT : Duty station which includes the billet. Corresponds to BG in Data Base Definition.

D

DEFCAT : Default Category. Corresponds to PL in Data Base Definition.

F

FINAL : The ultimate array which comes out from ASSIGN routine. Contains the name of candidates for desired billets.

I

IA : Do-loop counter.
IC : Counter for petty officers in P array.
IFLAG : Do-loop counter.
IP : Do-loop counter.
IPR : Do-loop counter.
IR : Do-loop counter.
IU : Do-loop counter.

J

J : Do-loop counter.
JC : Counter for petty officers in PR array.
JFLAG : Counter for FINAL array.
JU : First man check in UNITS array.

K

K : Do-loop counter.
KC : Counter for petty officers in PRL array.

L

L : Do-loop counter.
LC : Counter for petty officers in PRLC array.
LFLAG : Loss flag. Corresponds to PQ in Data Base
Definition.

M

M : Do-loop counter.

MC : Counter for petty officers in FINAL array for one billet. Prevents passing over 10 candidates for one billet.

N

N : Subscript for BIDS array.

NDUP : Number of duplications for the same candidate.

NEWRANK : Promoted rank.

NOB : Total number of billets in the Navy.

NOPO : Total number of petty officers in the Navy.

NPDATE : Next promotion date. Corresponds to PK in Data Base Definition.

O

OFLAG : Occupation flag. Corresponds to BM in Data Base Definition.

OLDRANK : Present rank. Corresponds to PC in Data Base Definition.

P

P : An array for ASSIGN routine. Contains the petty officers whose professions are matched to billet's required profession.

PBID : Billet identification number to which candidate has been previously nominated.

PFLAG : Promote Flag. Corresponds to PX in Data Base Definition.

POCITY : Current duty station city of petty officer. Corresponds to RG in Data Base Definition.

POPROF : Petty officer's profession. Corresponds to PP in Data Base Definition.

PORANK : Petty officer's rank. Corresponds to PC in Data Base Definition.

PR : An array for ASSIGN routine. Contains the petty officers whose professions and ranks are matched to billet.

PRL : An array for ASSIGN routine. Contains the petty officers whose professions, ranks, and language comprehension levels are matched to billet.

PRLC : An array for ASSIGN routine. Contains the petty officers whose professions, ranks, language comprehension levels and courses are matched to billet.

PROF : Petty officer's profession. Corresponds to PD in Data Base Definition.

PYEAR : Promotion date.

R

RDATE : Retirement date. Corresponds to PT in Data Base Definition.

REGNR : Petty officer's registration number. Corresponds to PA in Data Base Definition.

REGNRS : An array for ASSIGN routine. Contains the nominees' registration numbers.

RFLAG : Retirement flag.
0 corresponds to "wants to continue service;"
1 corresponds to "wants to retire."
ROPO : Rank of petty officer. Corresponds to PC in Data
Base Definition.
RQPROF : Required profession. Corresponds to BJ in Data
Base Definition.
RQRANK : Required rank. Corresponds to BI in Data Base
Definition.
RYEAR : Retirement date. Corresponds to PT in Data Base
Definition.

S

SEEFLAG : Sea eligibility flag. Corresponds to PU in Data
Base Definition.
SHEFLAG : Shore eligibility flag. Corresponds to PV in
Data Base Definition.

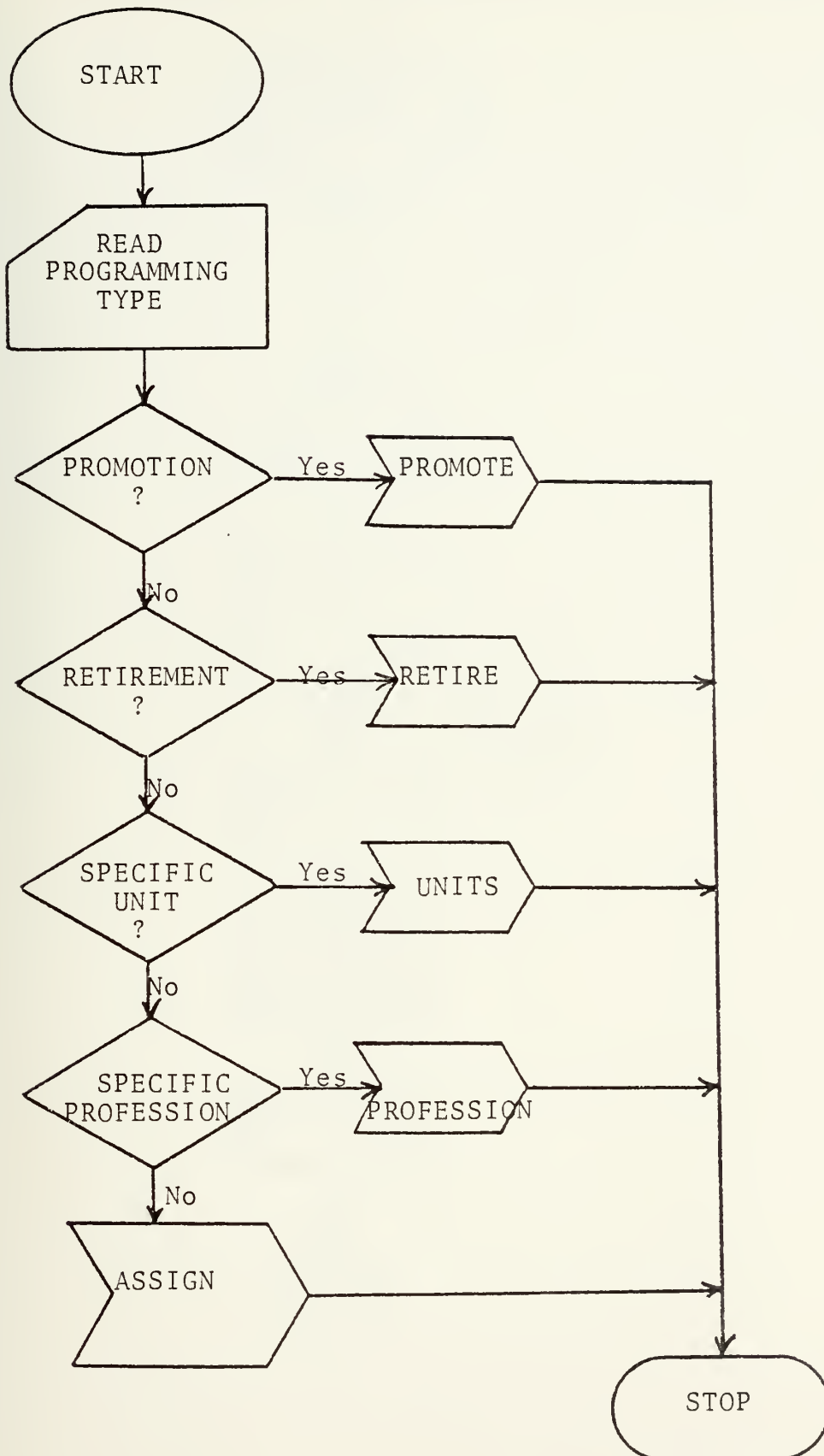
U

UNIT : Unit. Corresponds to RF and BG in Data Base
Definition.

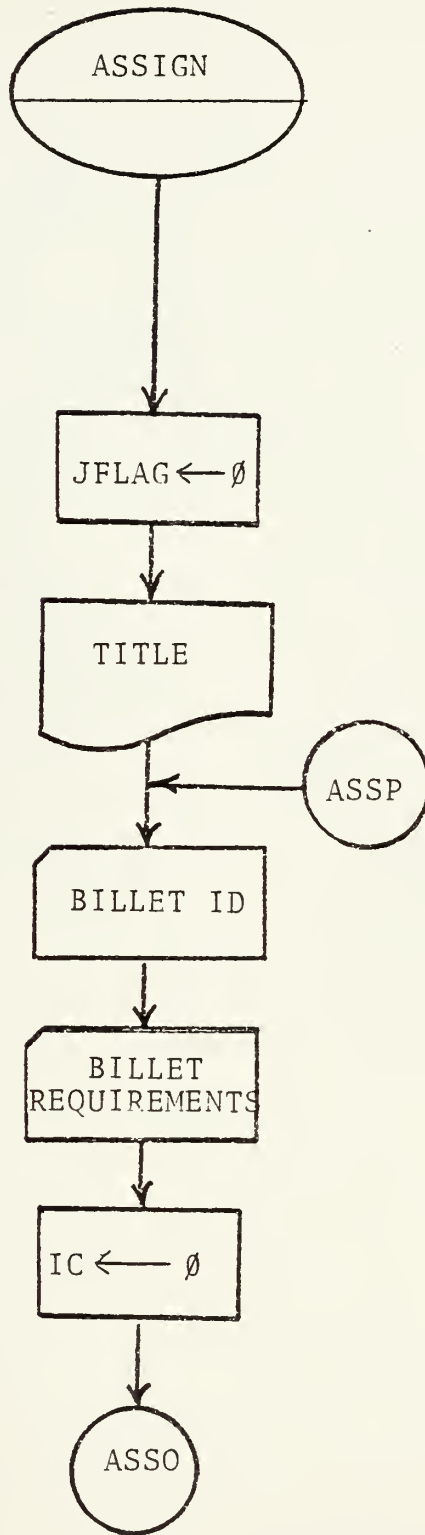
X

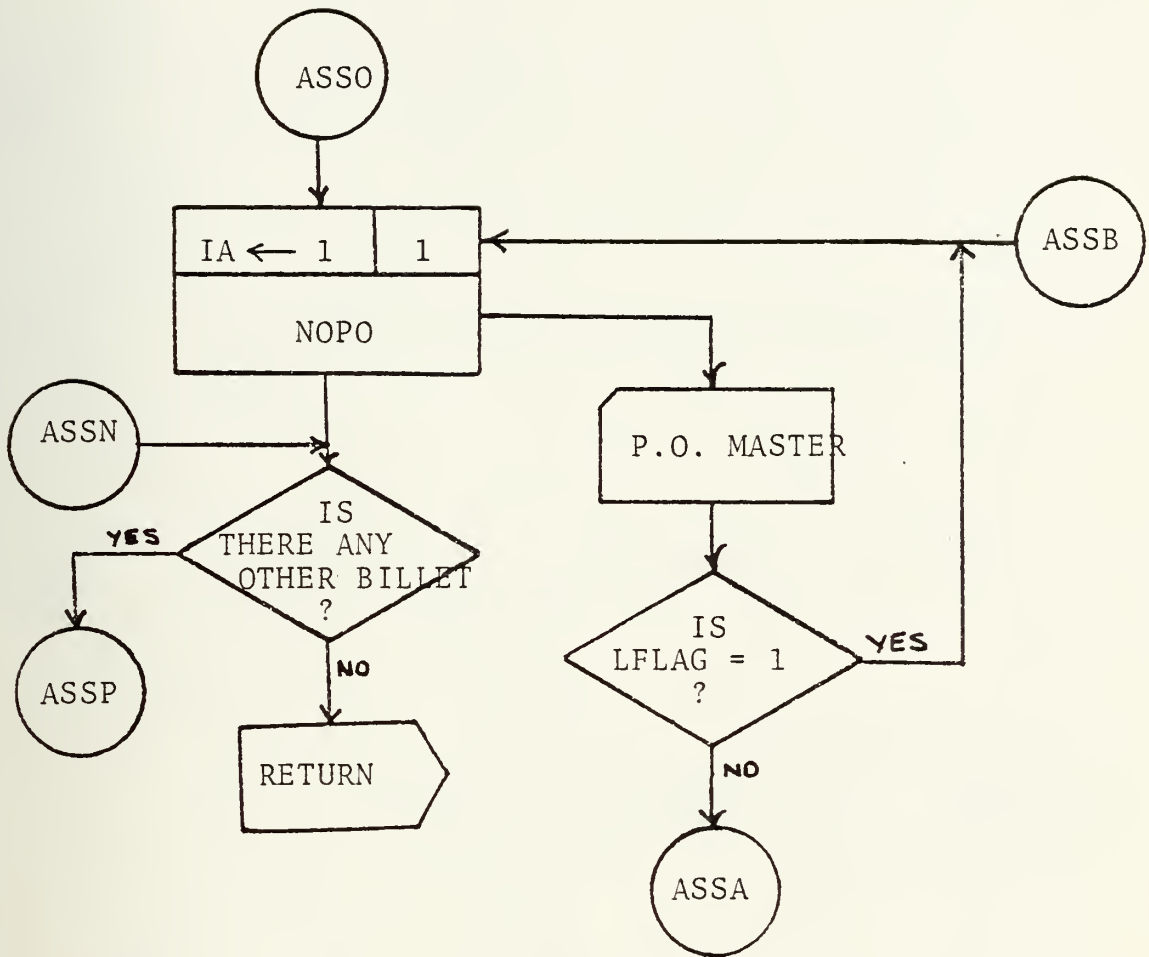
XFLAG : Transfer flag. Corresponds to PW in Data Base
Definition.

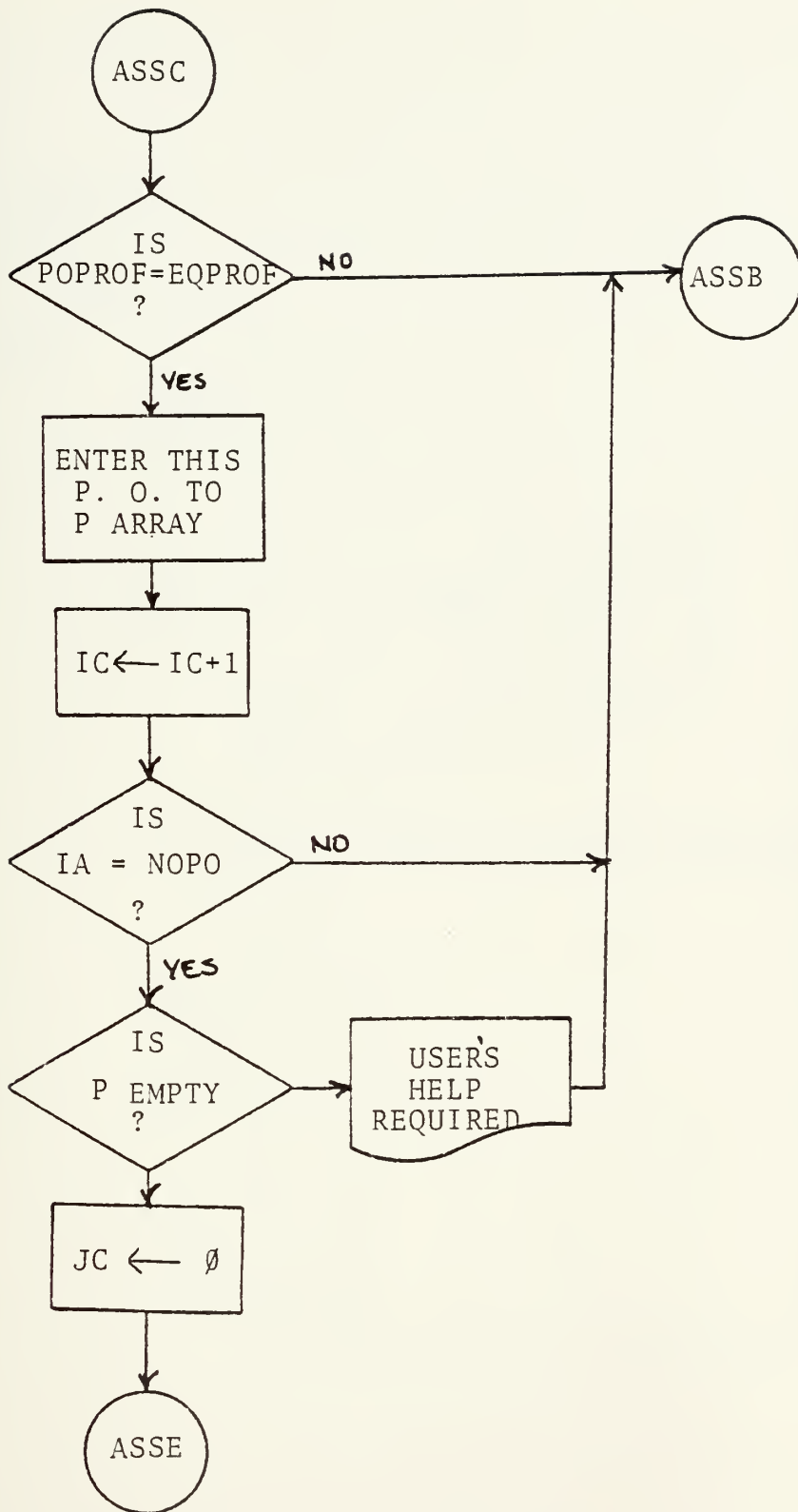
APPENDIX K1: FLOWCHART OF THE MAIN PROGRAM

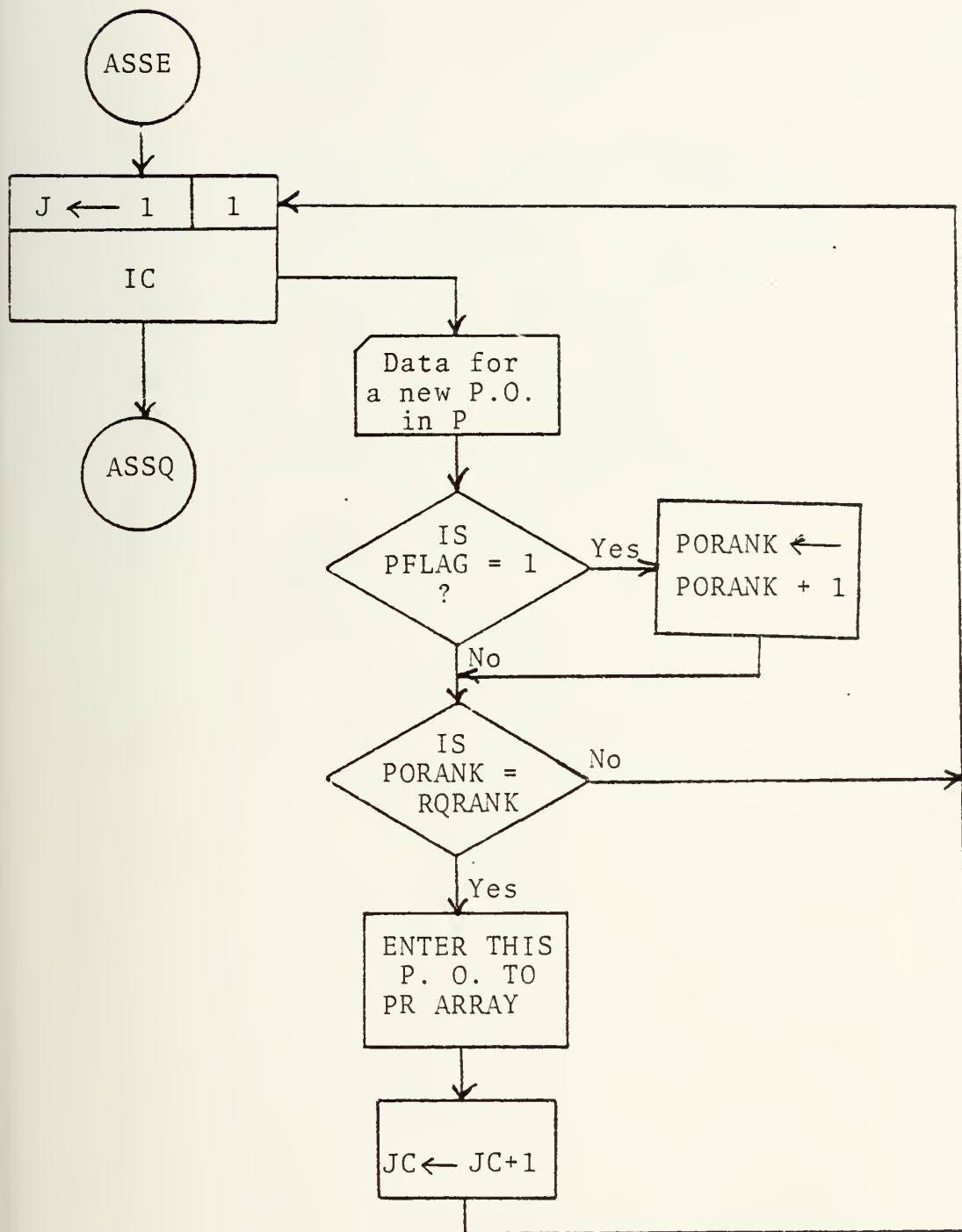


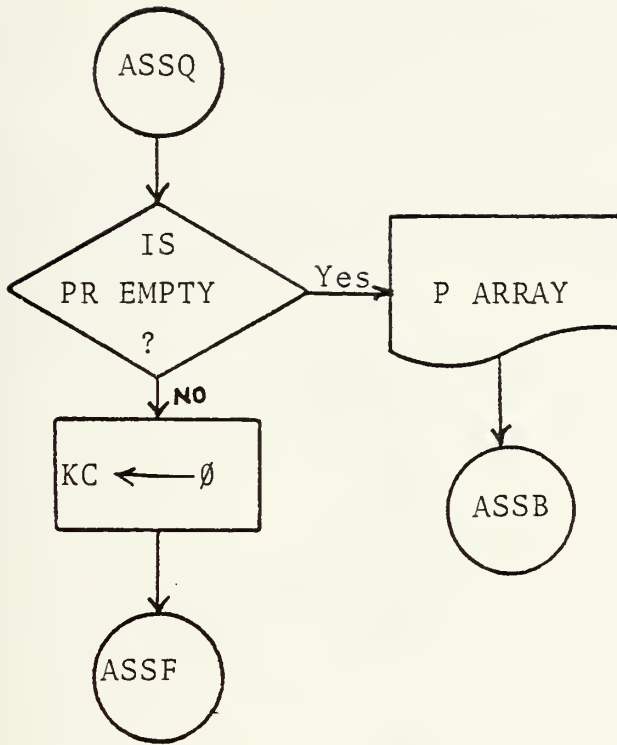
APPENDIX K2: FLOWCHART OF THE ASSIGN ROUTINE

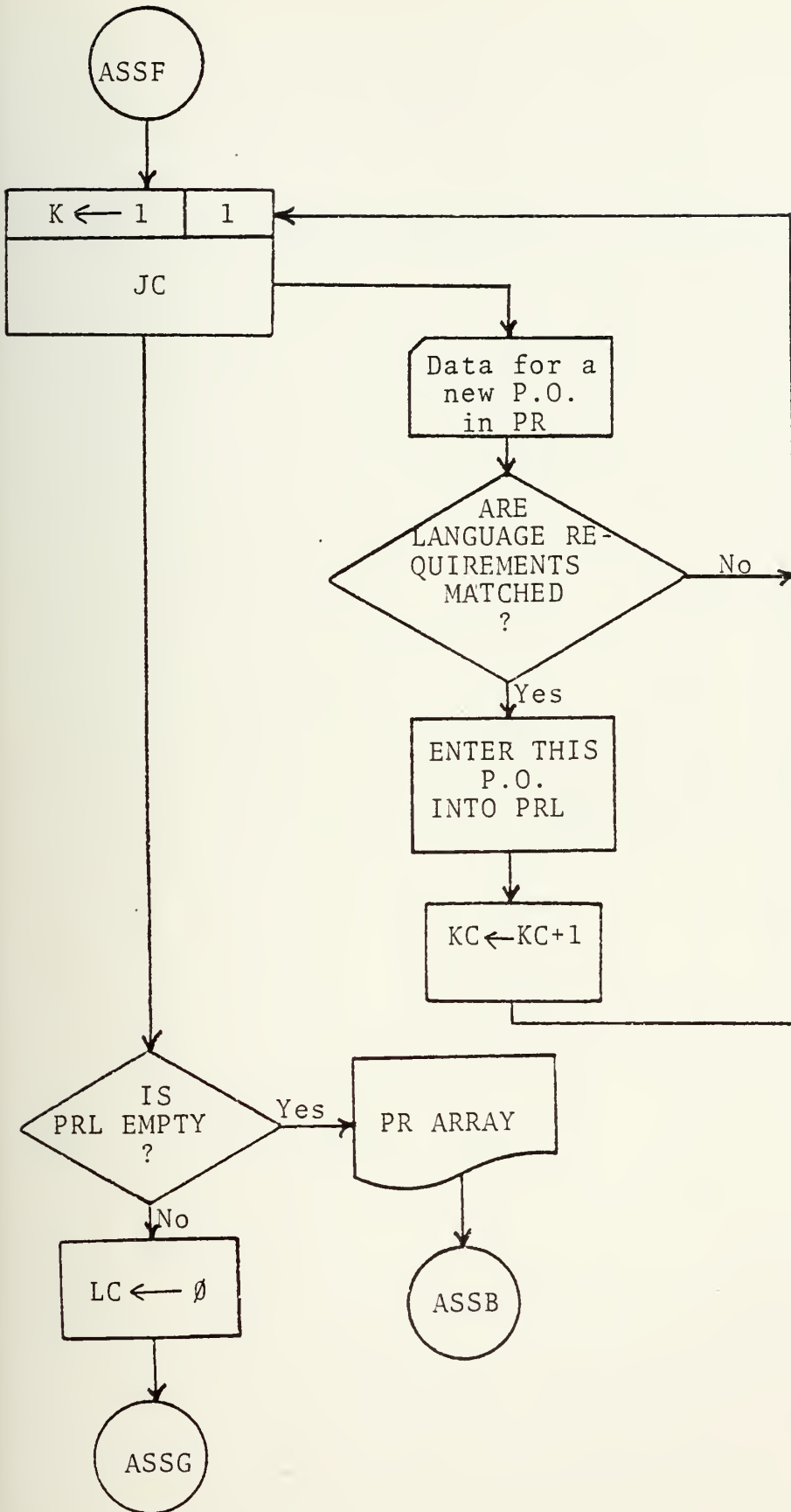


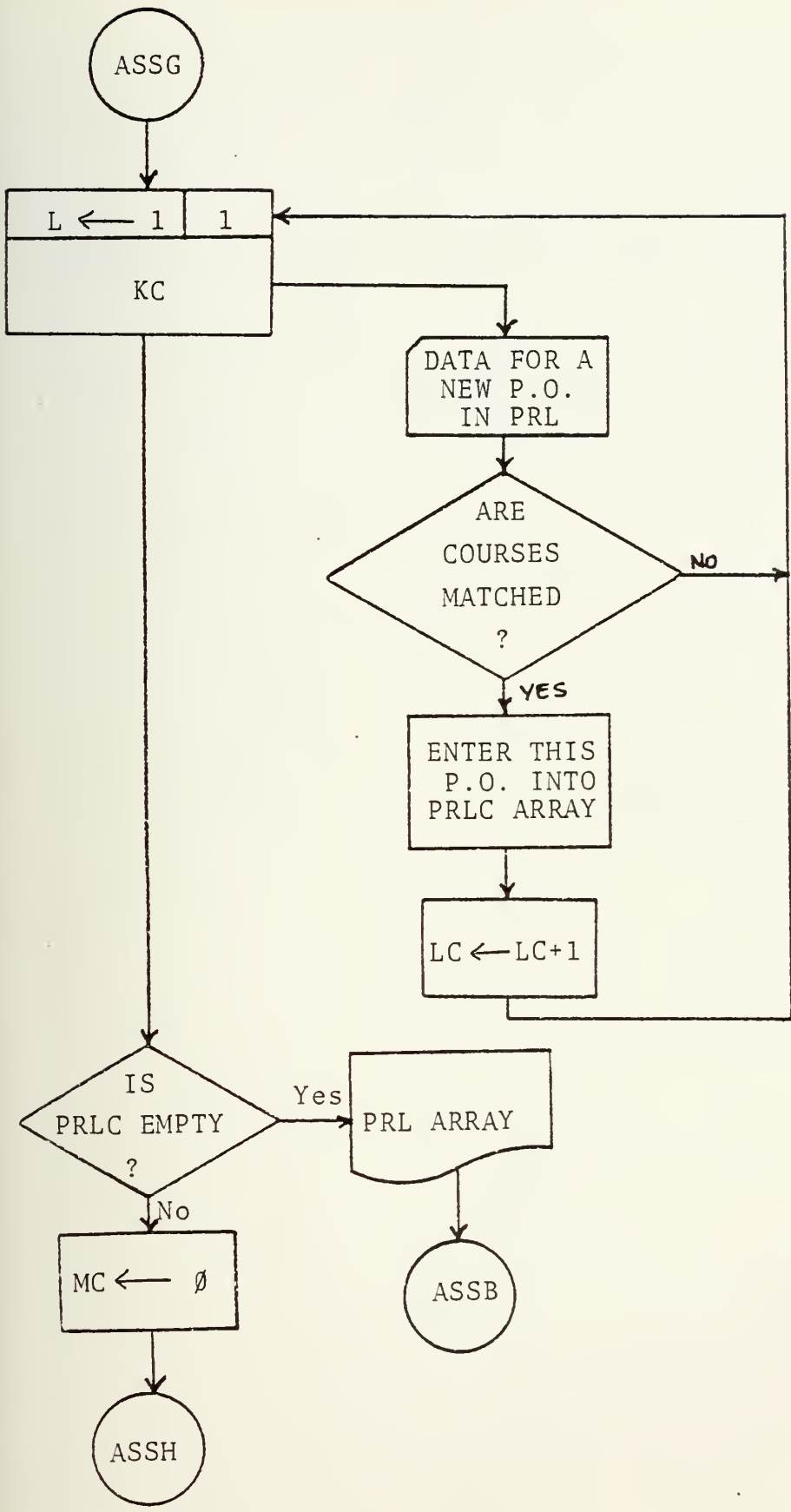












ASSG

L ← 1 | 1

KC

DATA FOR A
NEW P.O.
IN PRL

ARE
COURSES
MATCHED
?

NO

YES

ENTER THIS
P.O. INTO
PRLC ARRAY

LC ← LC+1

IS
PRLC
EMPTY
?

Yes

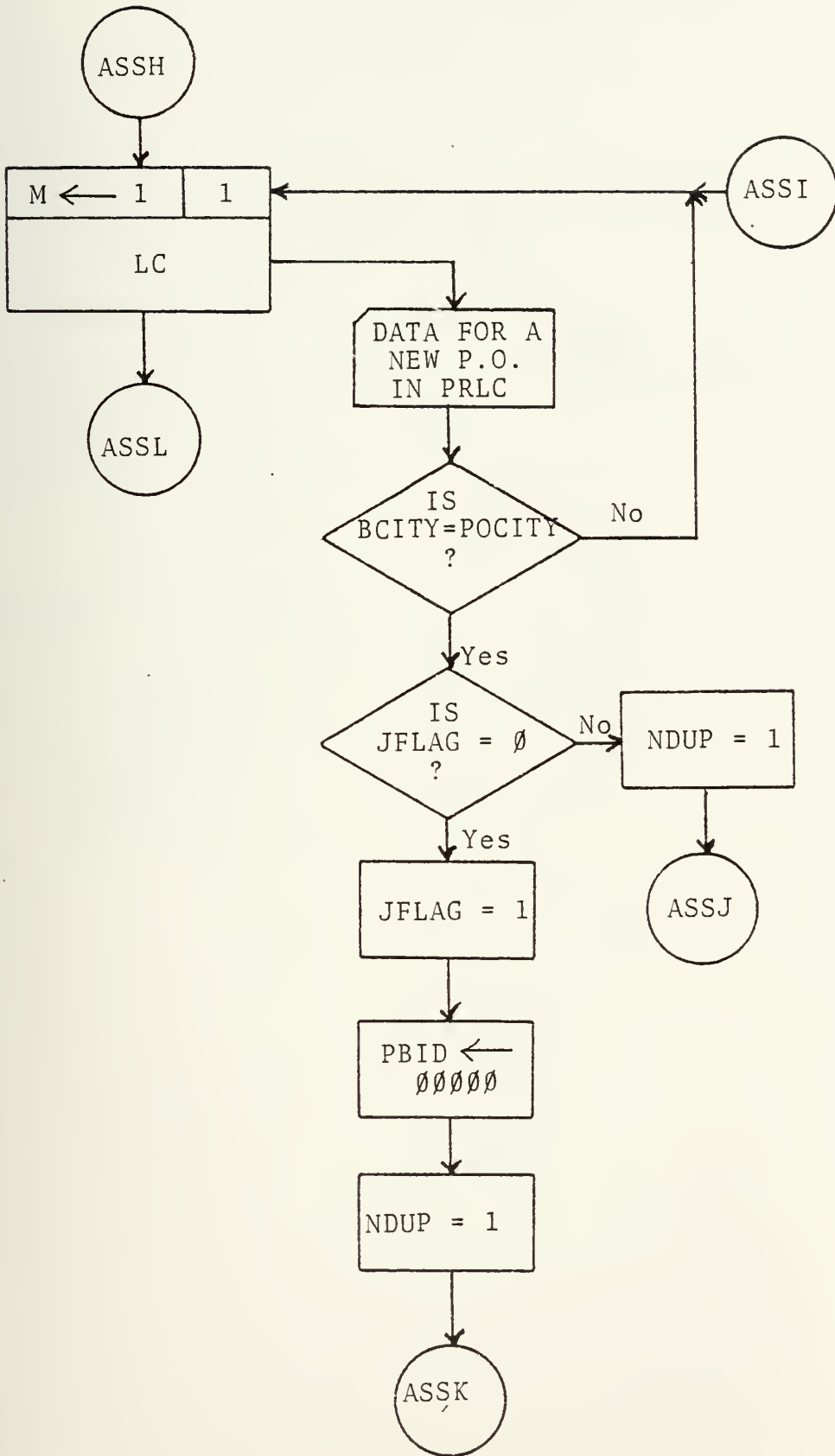
PRL ARRAY

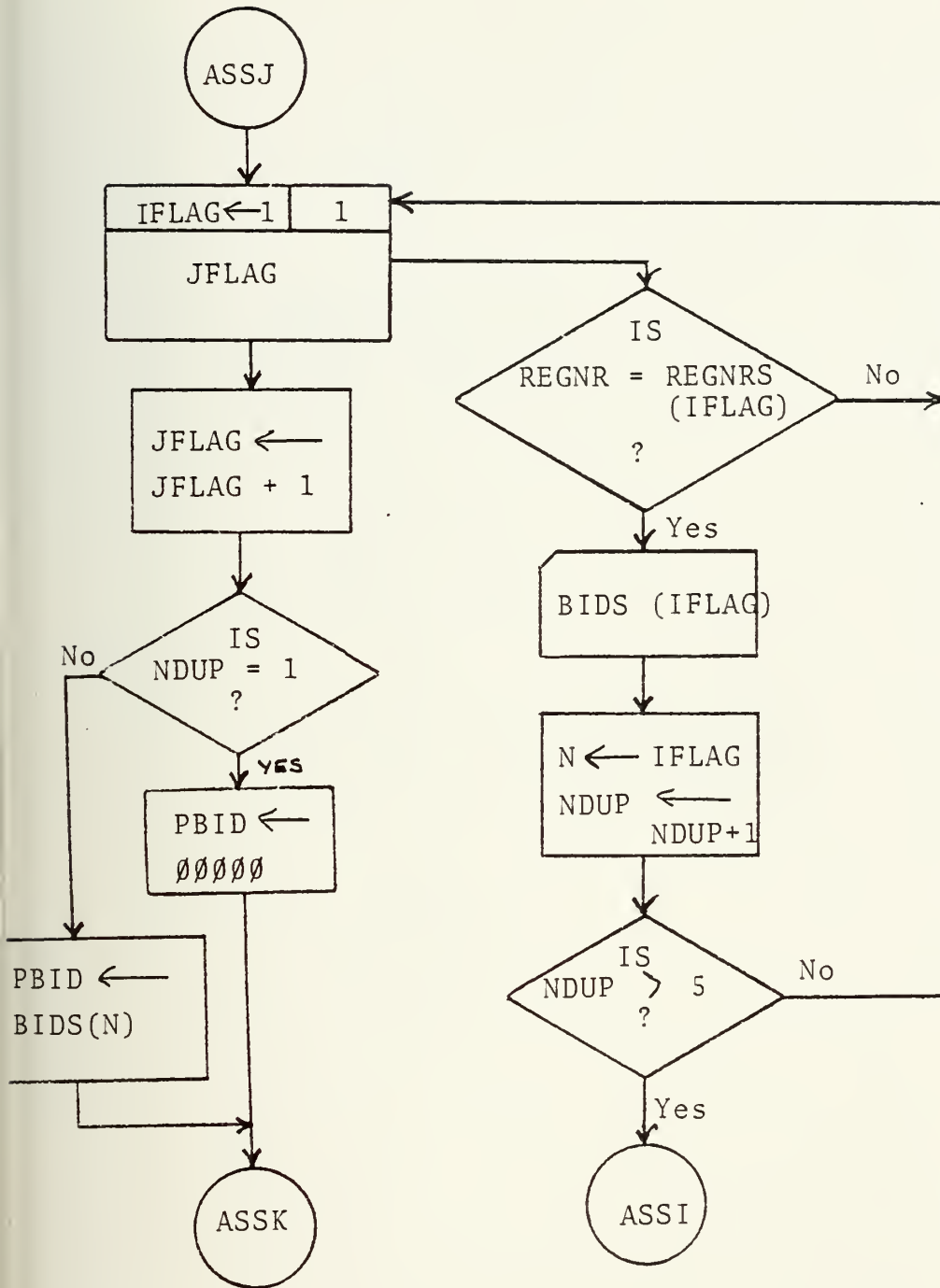
ASSB

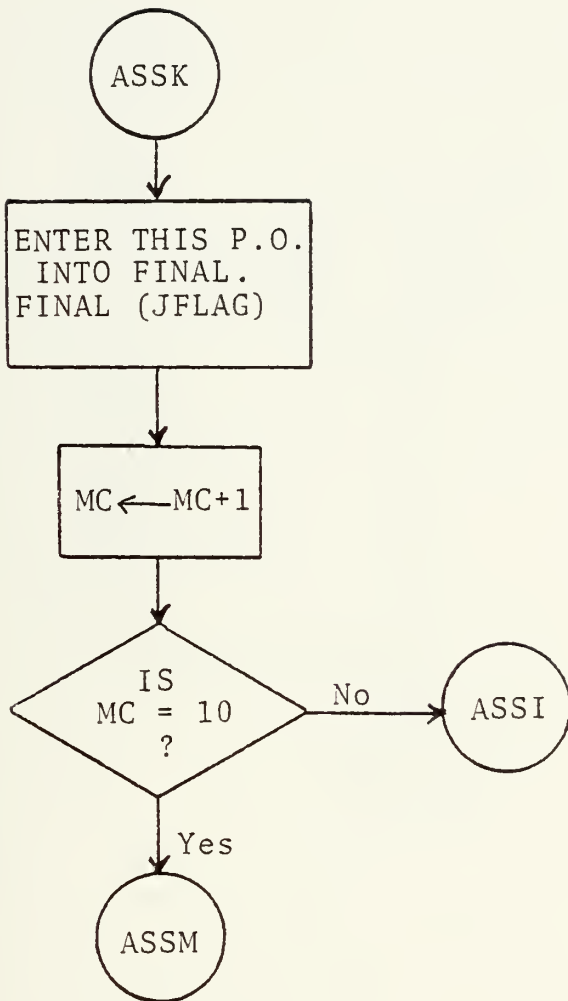
No

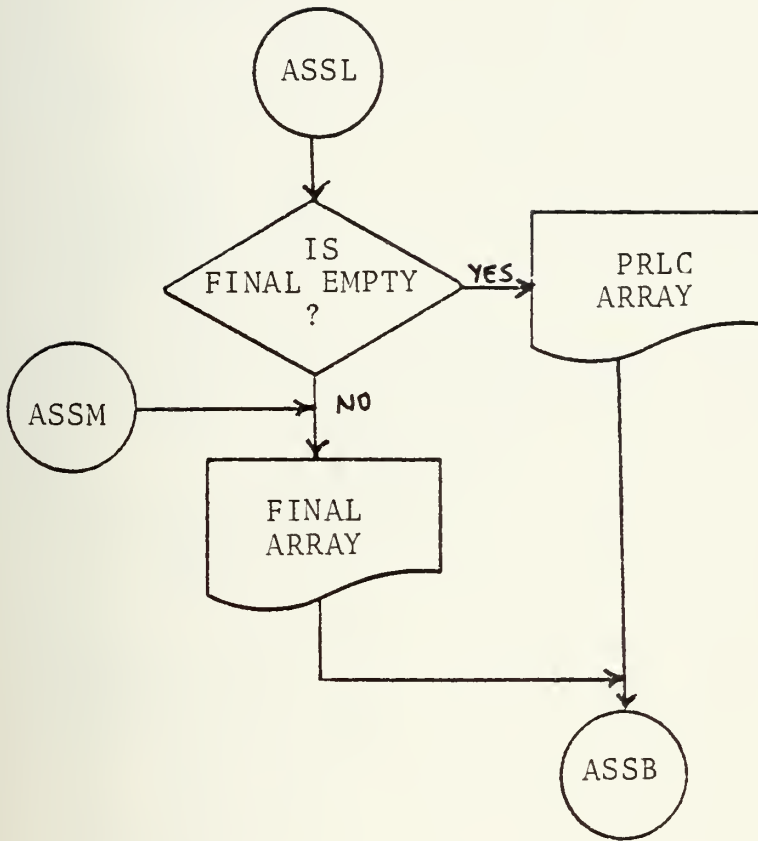
MC ← ∅

ASSH

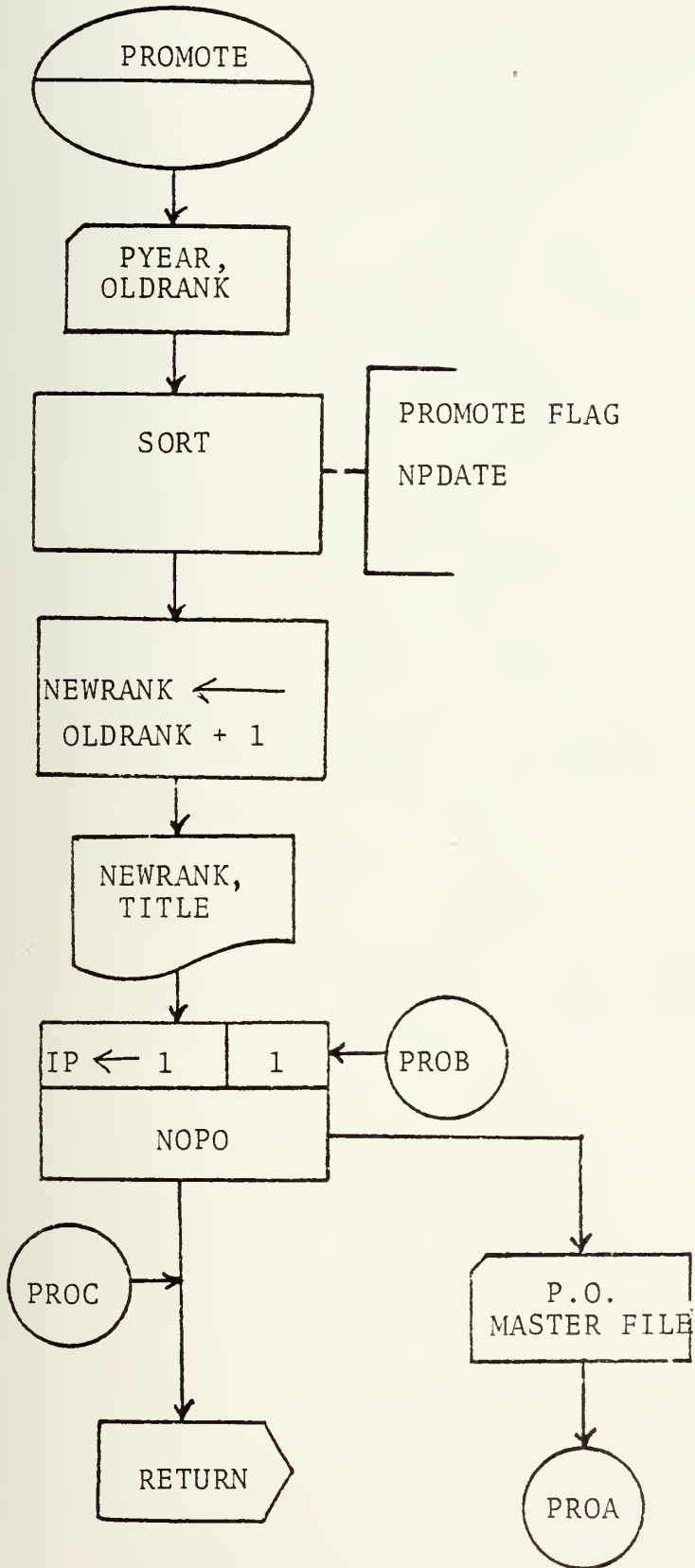


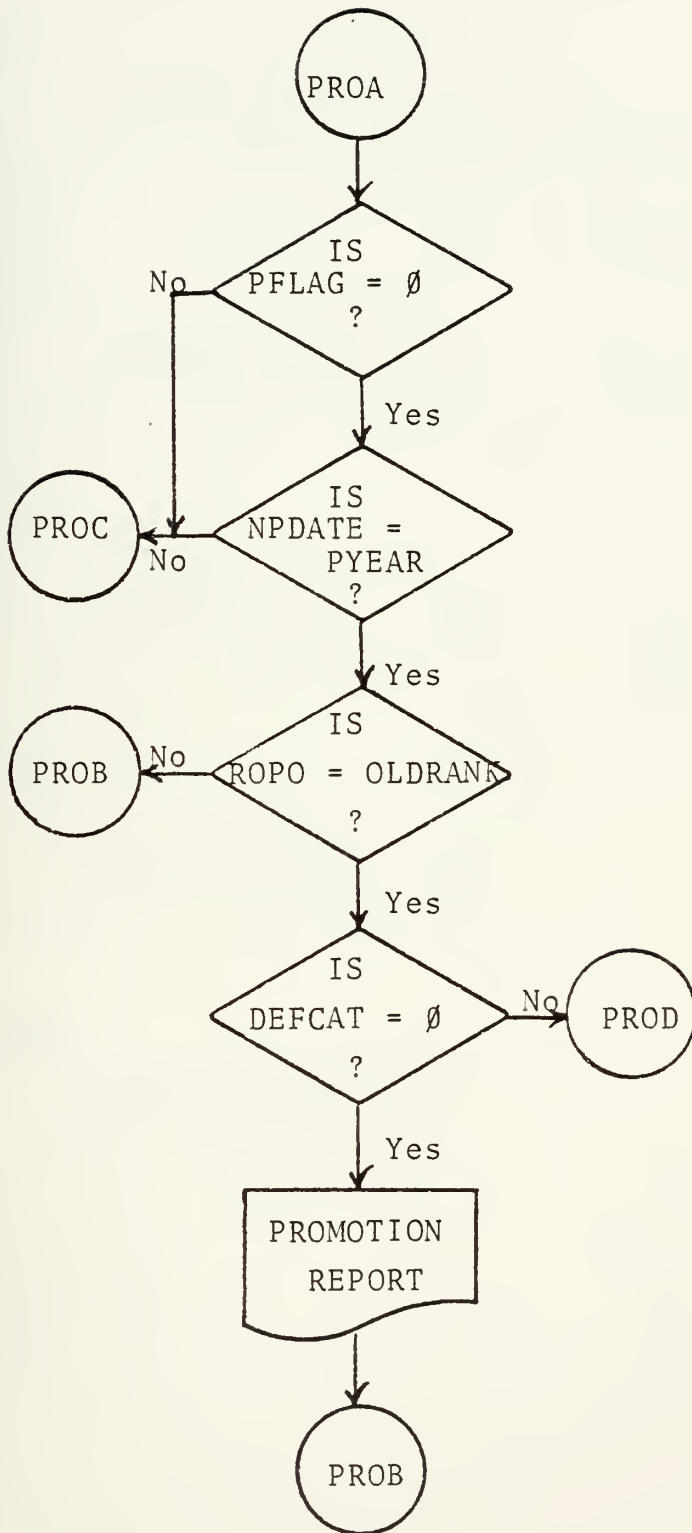


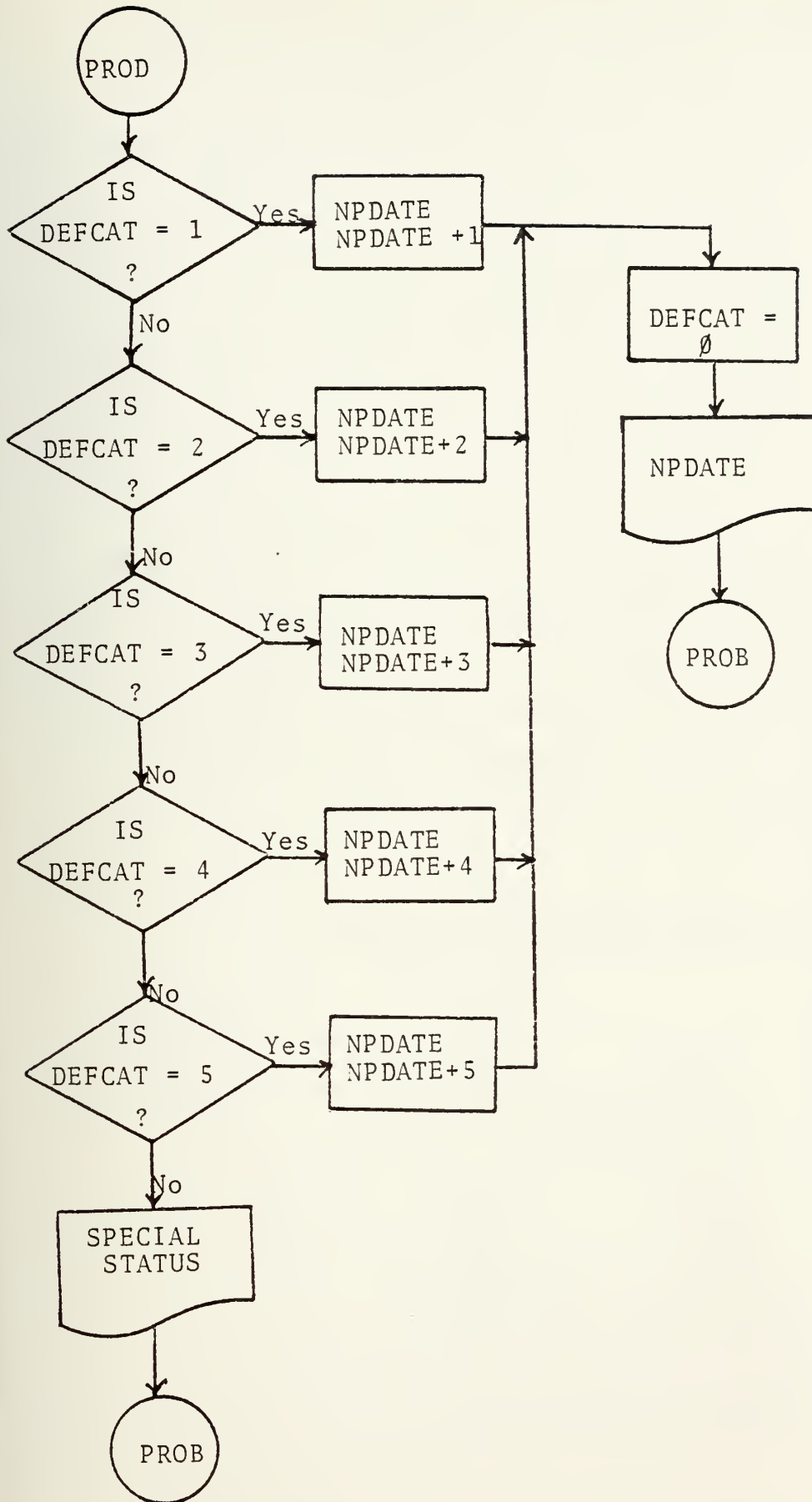




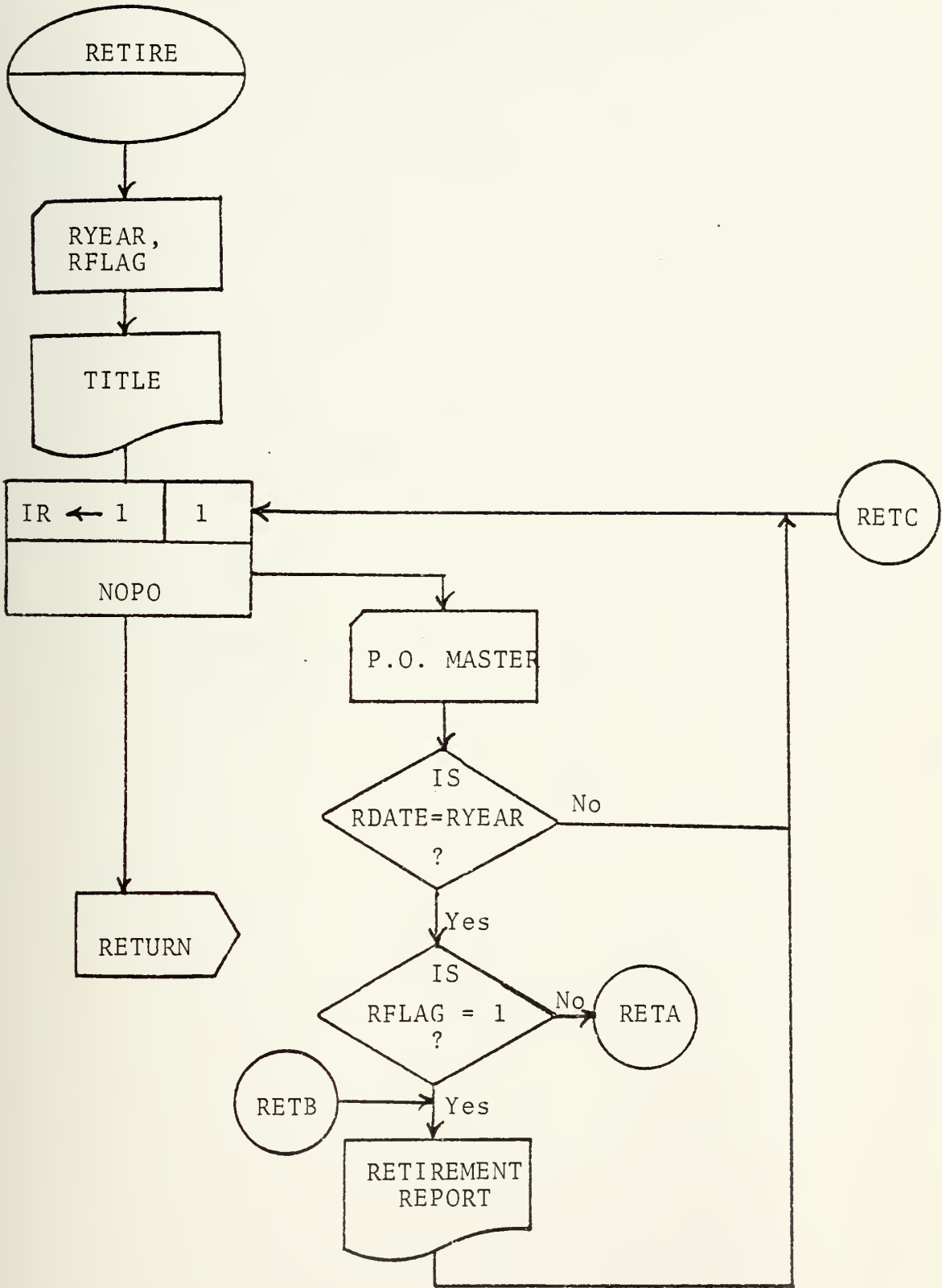
APPENDIX K3: FLOWCHART OF THE PROMOTE ROUTINE

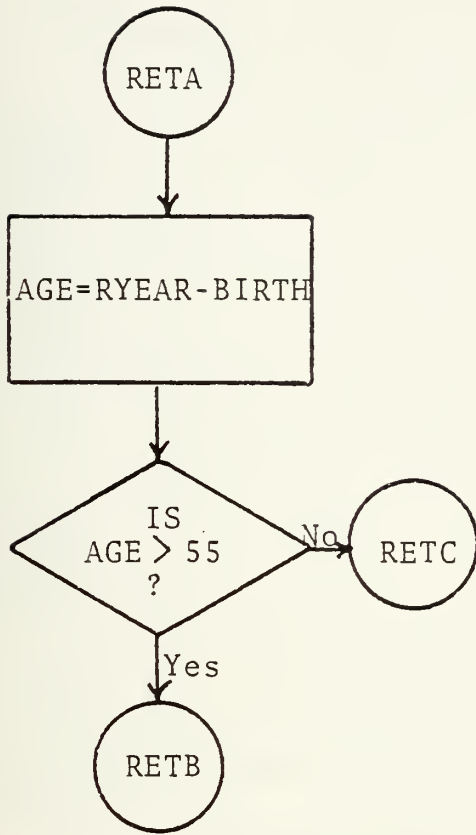




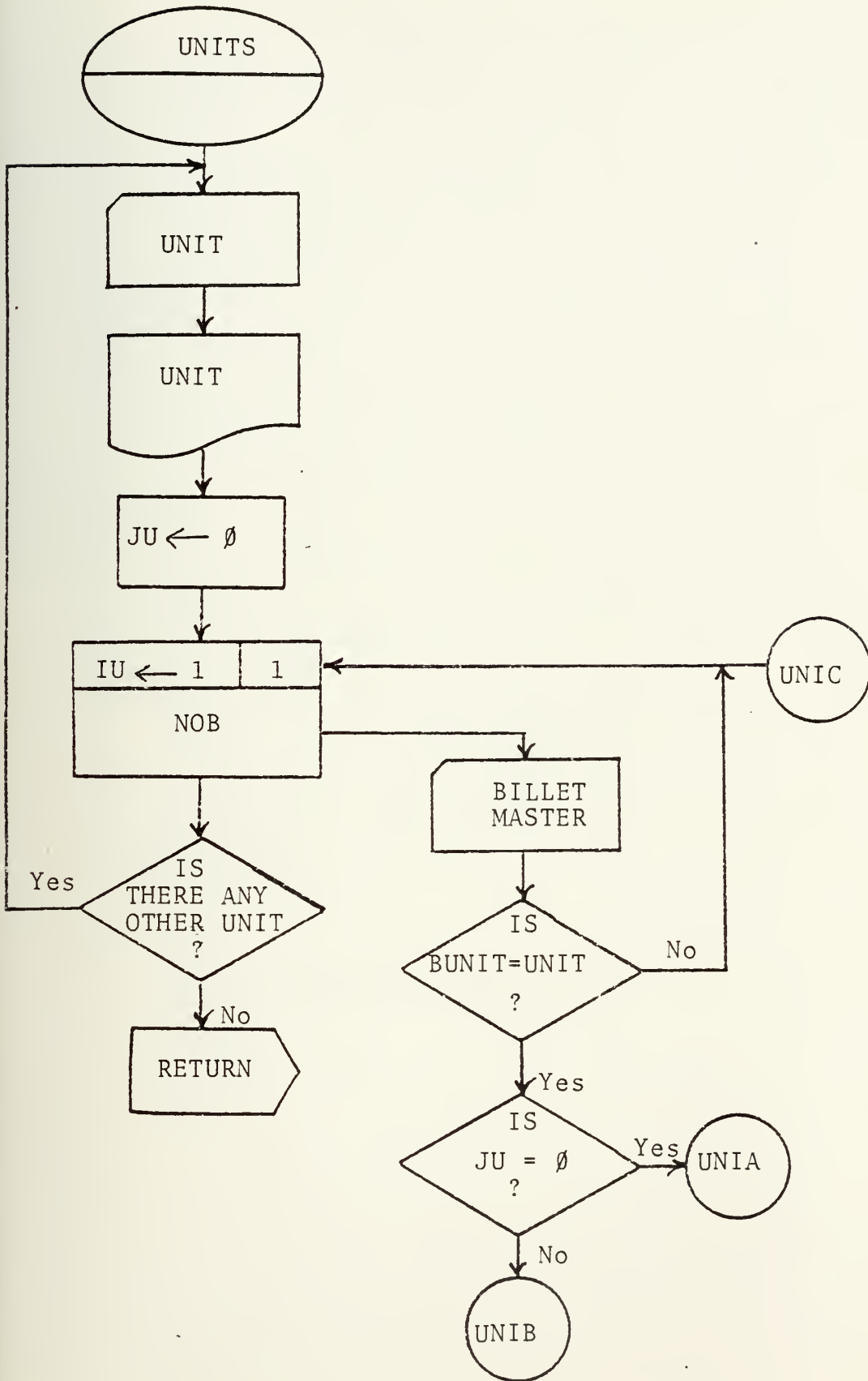


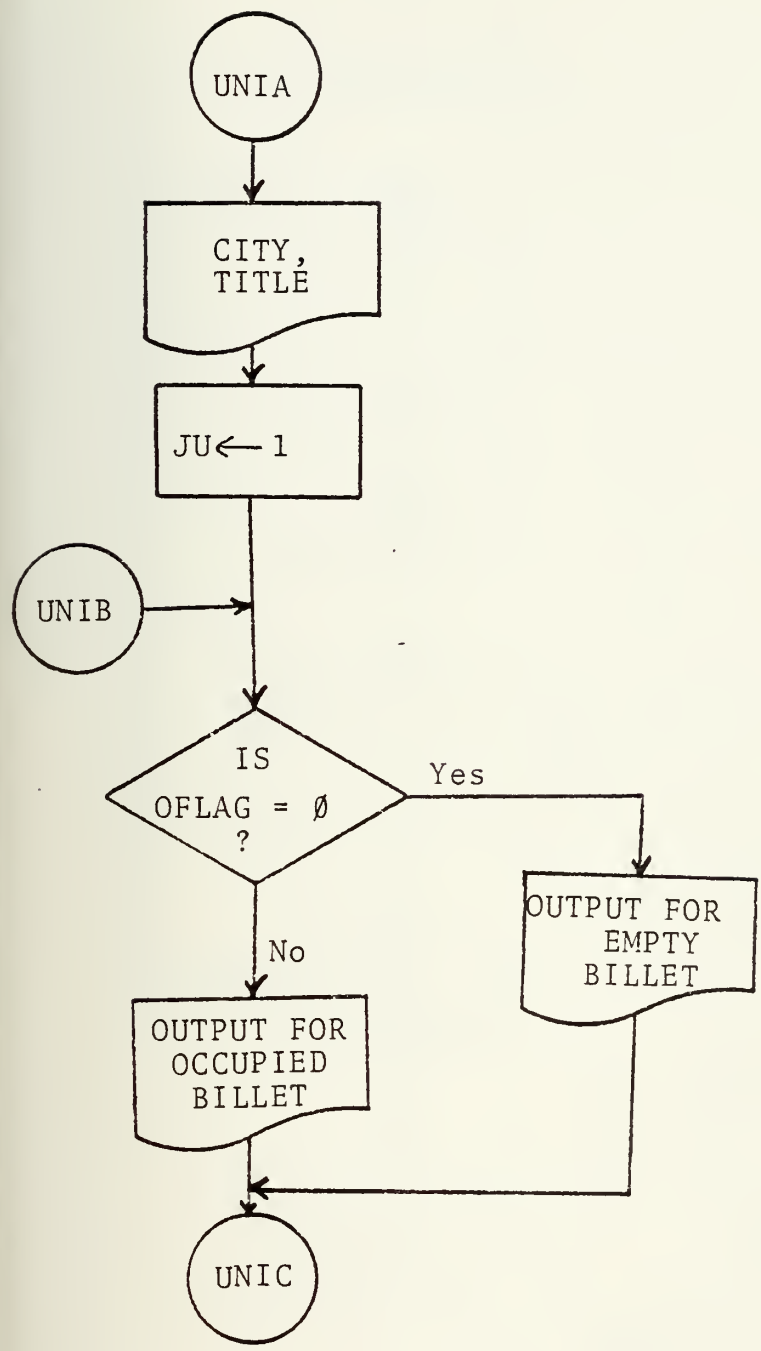
APPENDIX K4: FLOWCHART OF THE RETIRE ROUTINE



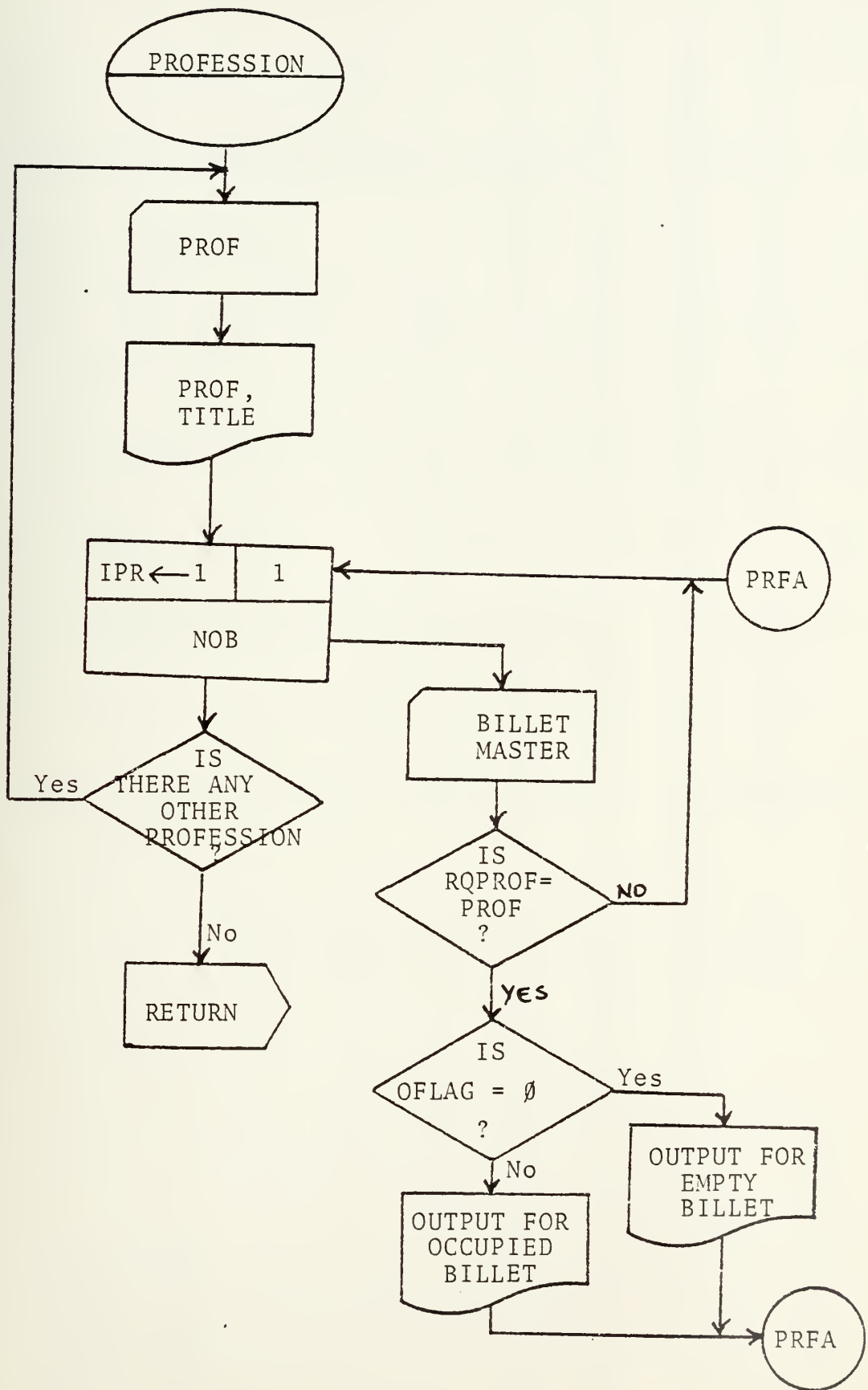


APPENDIX K5: FLOWCHART OF THE UNITS ROUTINE





APPENDIX K6: FLOWCHART OF THE PROFESSION ROUTINE



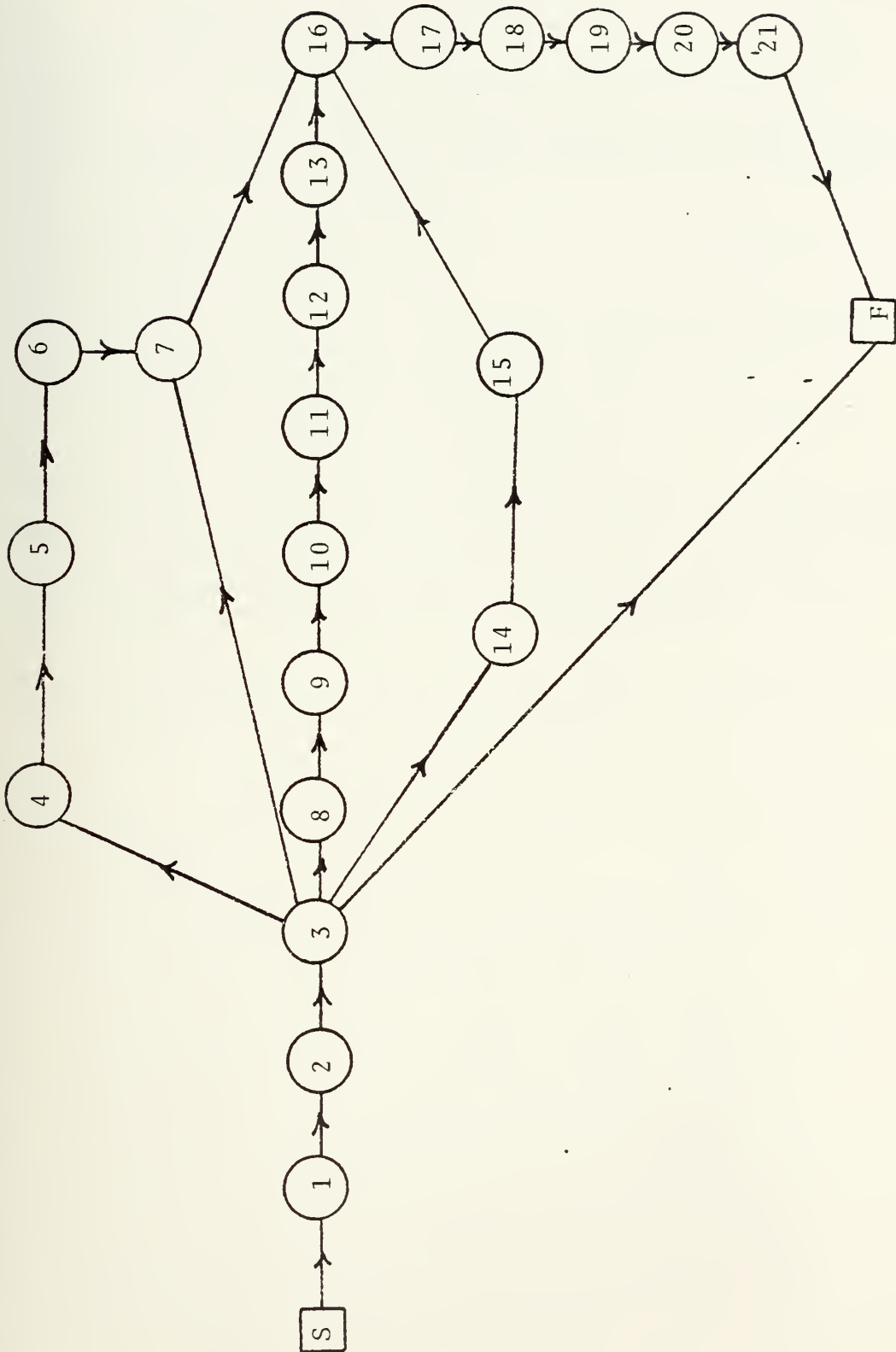
APPENDIX L: DECISION LOGIC TABLE FOR ELIGIBILITY

	1	2	3	4	5	6	7
SEA JOB?	Yes	Yes	Yes	Yes	Yes		
SHORE JOB?						Yes	Yes
1 YEAR?	Yes					Yes	
2 YEARS?		Yes					Yes
3 YEARS?			Yes				
4 YEARS?				Yes			
5 YEARS?					Yes		
NOT ELIGIBLE	X	X					
PERS OFF DECIDE			X	X		X	
HAS TO TRANSFER					X		X

APPENDIX M: DECISION LOGIC TABLE FOR SEA/SHORE ROTATION

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
WANT SEA?	Y	Y	Y	Y	Y	Y	Y	Y																	
WANT SHORE?								Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NO PREFERENCE?																		Y	Y	Y	Y	Y	Y	Y	Y
SEA $\geq \frac{2}{3}$ * TOTAL?	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SEA $< \frac{2}{3}$ * TOTAL?					Y	Y	Y	Y																	
LAST DUTY SEA?	Y	Y			Y	Y			Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
LAST DUTY SHORE?			Y	Y			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
RETIRE IN 2 YEARS?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	N
GO TO SEA	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X
TO TO SHORE								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PERS OFF DECIDE																									

APPENDIX N: NETWORK DIAGRAM FOR MIS IMPLEMENTATION



APPENDIX O: GLOSSARY

ADP	Automatic Data Processing
BUPERS	Bureau of Naval Personnel (U. S. Navy)
CADA	Computer Assisted Distribution and Assignment
CPM	Critical Path Method
DP	Data Processing
FVC	Total Number of Flexibility Vacancies in the Navy
MIS	Management Information System
NA	Naval Academy (Turkish Navy)
NC	Naval College (Turkish Navy)
POOC	Petty Officer Orientation Course (Turkish Navy)
POS	Petty Officer School (Turkish Navy)

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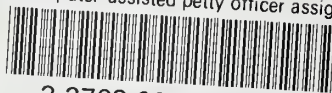
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