

**RESOURCE ALLOCATION
IN AGRICULTURAL RESEARCH
IN KENYA**

**PART 2
RAARES COMPUTER SYSTEM**

33.

Resource Allocation in Agricultural Research in Kenya
- Part 2, Raares Computer System

Old evaluation report number was 3.3.2

**A REPORT PREPARED FOR
THE NATIONAL COUNCIL
FOR SCIENCE AND TECHNOLOGY**

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Nairobi September 1982

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A REPORT PREPARED FOR
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FOR SCIENCE AND TECHNOLOGY

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NAIROBI SEPT. 1982

C O N T E N T S - PART II

CHAPTER I	-	INTRODUCTION
		A) Objectives
		B) Methodology
CHAPTER II	-	SYSTEM DESCRIPTION
		A) System Flowchart
		B) Sources of Data
		(i) Form A - Institutional Resources
		(ii) Form B - Project Identification
		(iii) Form C - System of Resource Allocation
		C) File Description
		(i) Main Data File
		(a) Diskette Records
		(b) Magnetic Tape Records
		(ii) Dictionary Files
		(a) Institutional Dictionary File
		(b) Subject Area Dictionary File
		(c) Project Dictionary File
		(d) Programme Dictionary File
		(e) Fields of Research Dictionary File
		(f) Major Scientific Equipment Dictionary file
CHAPTER III	-	PROGRAM SPECIFICATIONS
		A) General Programs
		(i) Program RAARP 80
		(ii) Program RAARP 81
		(iii) Program RAARP 82
		(iv) Program RAARP 83
		(v) Program RAARP 84
		(vi) Program RAARP 90
		(vii) Program RAARP 91
		(viii) Program RAARP 92
		B) Tabulation Programs
		(i) Program RAARPØ1A
		(ii) Program RAARPØ1B

- (iii) Program RAARP02
- (iv) Program RAARP03
- (v) Program RAARP04A
- (vi) Program RAARP04B
- (vii) Program RAARP05
- (viii) Program RAARP06
- (ix) Program RAARP07
- (x) Program RAARP08

CHAPTER IV

-

OPERATING PROCEDURES

A) General Listings

- (i) Job RAART 80
- (ii) Job RAART 81
- (iii) Job RAART 82
- (iv) Job RAART 83
- (v) Job RAART 84

B) Dictionary File Listings

- (i) Job RAART 90
- (ii) Job RAART 91
- (iii) Job RAART 92

C) Main Tabulations

- (i) Jobs RAART01A, RAART01B, RAART02,
RAART03, RAART05A, RAART05B, RAART06
- (ii) Jobs RAART04A, RAART04B
- (iii) Job RAART07
- (iv) Job RAART08

CHAPTER V

-

OBSERVATIONS AND RECOMMENDATIONS

APPENDICES

- I PRINT LAYOUTS
- II A SUMMARY OF LISTS AND TABLES
- III AN EXAMPLE OF LIST AND TABLE PRINTOUTS
- IV SOURCE DATA QUESTIONNAIRS
- V DATA AMENDMENT SHEET
- VI LIST OF INSTITUTIONS
- VII GEOGRAPHICAL CODES
- VIII ECOLOGICAL ZONES
- IX CATEGORY OF PROGRAMME

XI	COMMODITY UNDER RESEARCH
XII	TECHNICAL FACTORS LIMITING PRODUCTION
XIII	FIELDS OF RESEARCH
XIV	QUALIFICATIONS
XV	NATIONALITIES
XVI	DESIGNATIONS
XVII	MAJOR SCIENTIFIC EQUIPMENT
XVIII	CONDITION OF SCIENTIFIC EQUIPMENT
XIX	PROGRAMME IDENTIFICATION
XX	PROJECT IDENTIFICATION

P R E F A C E

In its report on Science and Technology for Development, the National Council for Science and Technology (NCST) makes a number of observations regarding agricultural research in Kenya. It is observed that the effective use of appropriate types of technology is crucial to the success of rural agricultural development and that such innovations have proved to be the most powerful tools for increasing the productivity of the available resources. The report further indicates that although such innovations have enabled Kenya to double her agricultural output over the past twenty years as in the case of hybrid maize and dairy, no research breakthroughs are currently available to facilitate similar quantum jumps. It is therefore considered imperative, in the prevailing difficult economic situation throughout the world, that every effort be made especially in developing countries to direct the limited research resources to areas of priority need, especially those which offer the best input-output advantage. Towards this objective the study reported here was launched as a special investigation by the NCST to provide an insight in the current system of resource allocation to and within Kenya's agricultural research system and to suggest ways and means of improving the system of resource allocation and management to increase efficiency.

Although the study, which was launched in 1980, took a much longer time than originally expected due to the complexity of the system and lack of systematic documentation, the report contains a number of recommendations whose implementation should greatly improve the efficiency of agricultural research in Kenya. It is emphasized that the views expressed in this report reflect only the findings of the team of consultants and do not necessarily coincide with those of the NCST or any other government agency. The report is in two parts. Part I contains the main body of findings and recommendations while Part II describes in detail the computer system developed for registration of projects and programmes, and the processing of their data.

The study team wishes to express sincere thanks to the Directors of Research in Ministries of Agriculture and Livestock Development, the Directors and staff of research^{stations} and the Director and staff of Government Computer Services for their active cooperation and assistance during the study. Thanks are also due to Mr. Bruce Scott of IDRC for his guidance and encouragement and to Prof. P. Gacii, Secretary NCST, for his support.

This study was commissioned by the National Council for Science and Technology with financial support from International Development Research Center (IDRC) of Canada, under project agreement ref. 3-A-80-4085. The support by these two organizations is gratefully acknowledged.

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CHAPTER I

INTRODUCTION

- 1.1 This Part II of the study is primarily concerned with Computer coding, keying, storage and retrieval of data pertaining to Resource Allocation in Agricultural Research (RAARES). It also deals with the processing and analysis of this data to produce various reports and tables as required.

(A) OBJECTIVES

- 1.2 The immediate objective of the RAARES computer system is to produce a set of computerised programs and documentation to enable preliminary data of the survey on Resource Allocation in Agricultural Research to be processed into acceptable reports.
- 1.3 It is also the long term objective of this computer exercise to establish a basis onto which a registration and documentation system for all research projects in the country can be built.

(B) METHODOLOGY

- 1.4 After extensive consultations, three types of questionnaires were designed namely FORM A - Institutional Resources, FORM B - Project Identification, FORM C - System of Resource Allocation. Coding spaces were included in the individual questions to minimize transcription errors. Certain fields were precoded to facilitate easy coding of the rest of the fields. These precoded fields include record type, budgeting cost items, and numbering of individual scientists. There are thirteen types of records altogether covering the three questionnaires with a maximum recording length of 98 characters.
- 1.5 Data was coded on the questionnaires in accordance with the instructions accompanying the questionnaires. This data was

then keyed onto 128 character diskettes and categorised into raw data, data on institutions of research, subject areas, projects, programmes, fields of research and scientific equipment (See Appendices III and VI through XX). This data is then used on about 18 programs to produce various tables and lists as explained in Chapters III, IV and Appendix II.

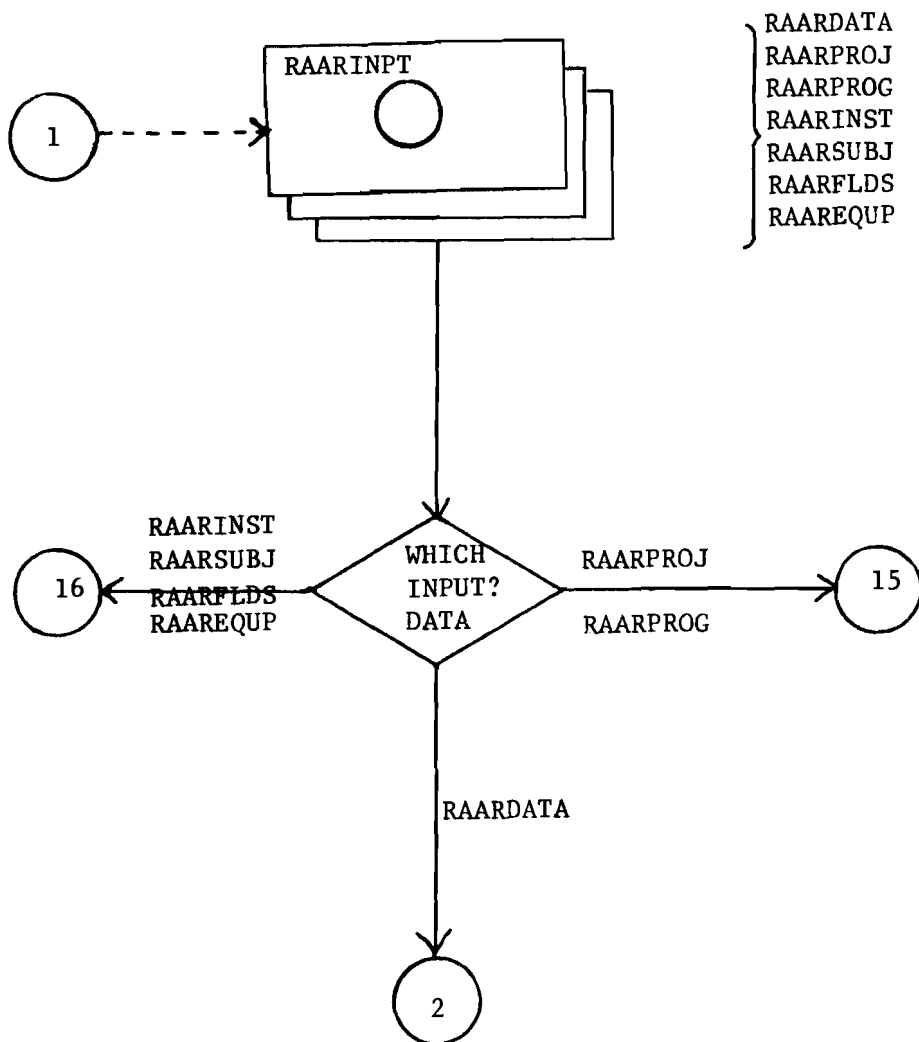
- 1.6 The computer programs are designed in Cobol language to run on IBM System 370/138 using DOS/VSE operating system and requires facilities for reading cards, diskettes, magnetic tapes, disks and for printing. A program takes on average one minute to compile, about 20 minutes to produce a table, and a maximum of 260 K. bytes of core storage.
- After the data for the initial survey has been processed subsequent updates and amendments can be made using the Data Amendment Sheet shown in Appendix V.

CHAPTER II

SYSTEM DESCRIPTION

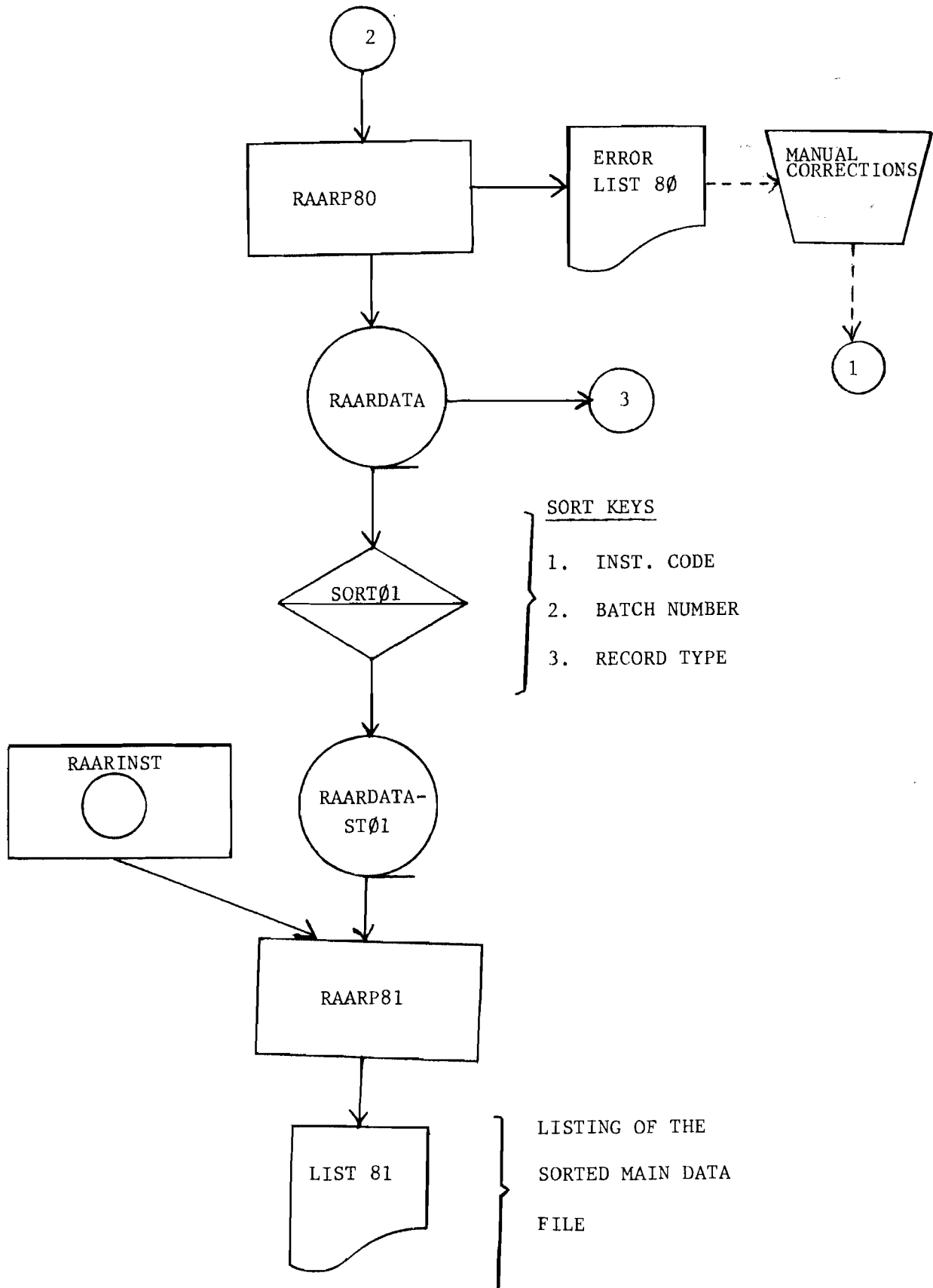
2.1 This chapter describes the system by highlighting three main areas. The section on System Flowchart gives an overview of the RAARES Computer System, while the Sources of Data section gives a brief description of the questionnaires used to collect the initial data. The File Description section covers in some detail the two categories of files used in the system, namely the main data files and the dictionary files.

(A) SYSTEM FLOWCHART



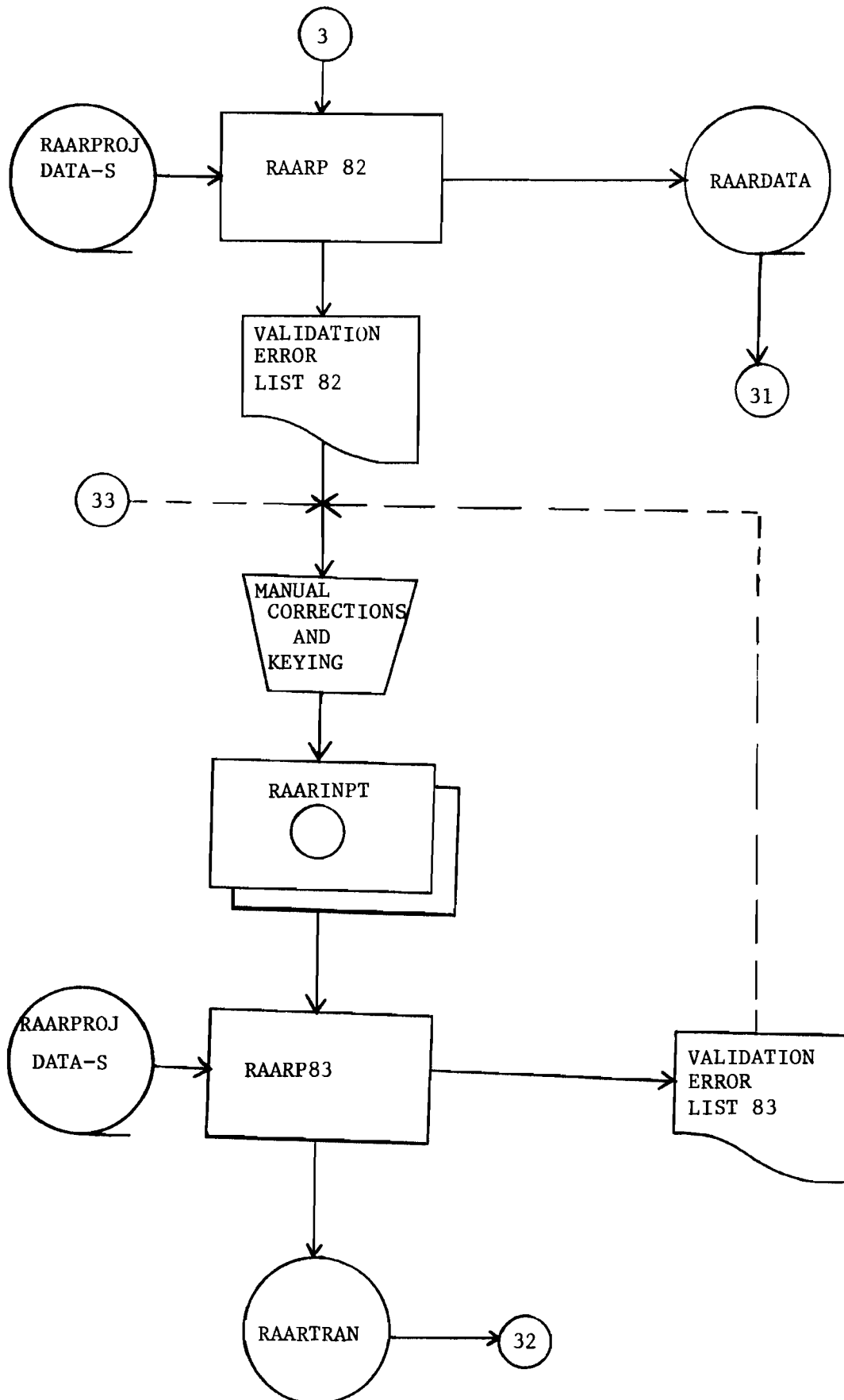
LIST 80 (JOB NAME RAART80)

LIST 81 (JOB NAME RAART81)

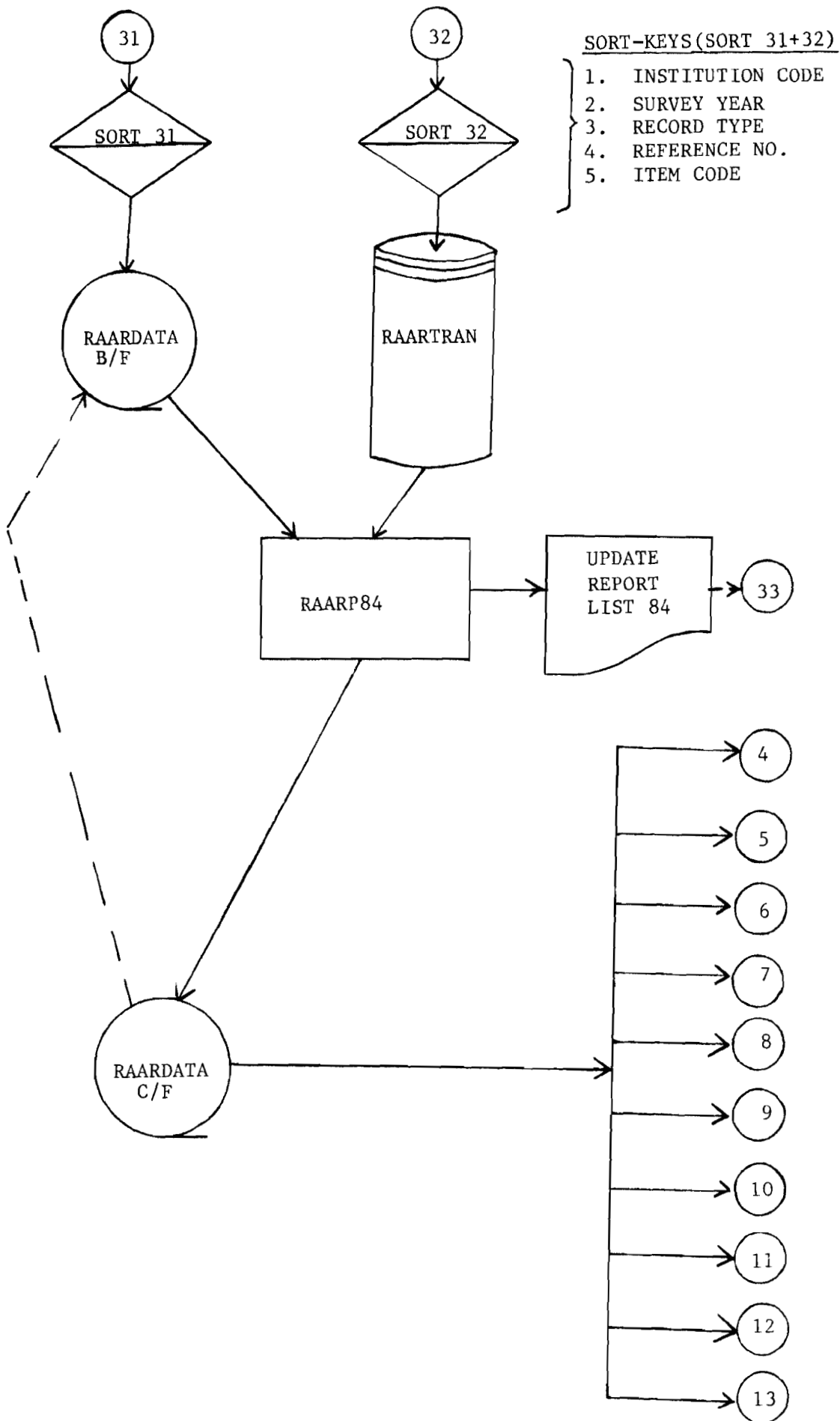


LIST 82 (JOB NAME RAART 82)

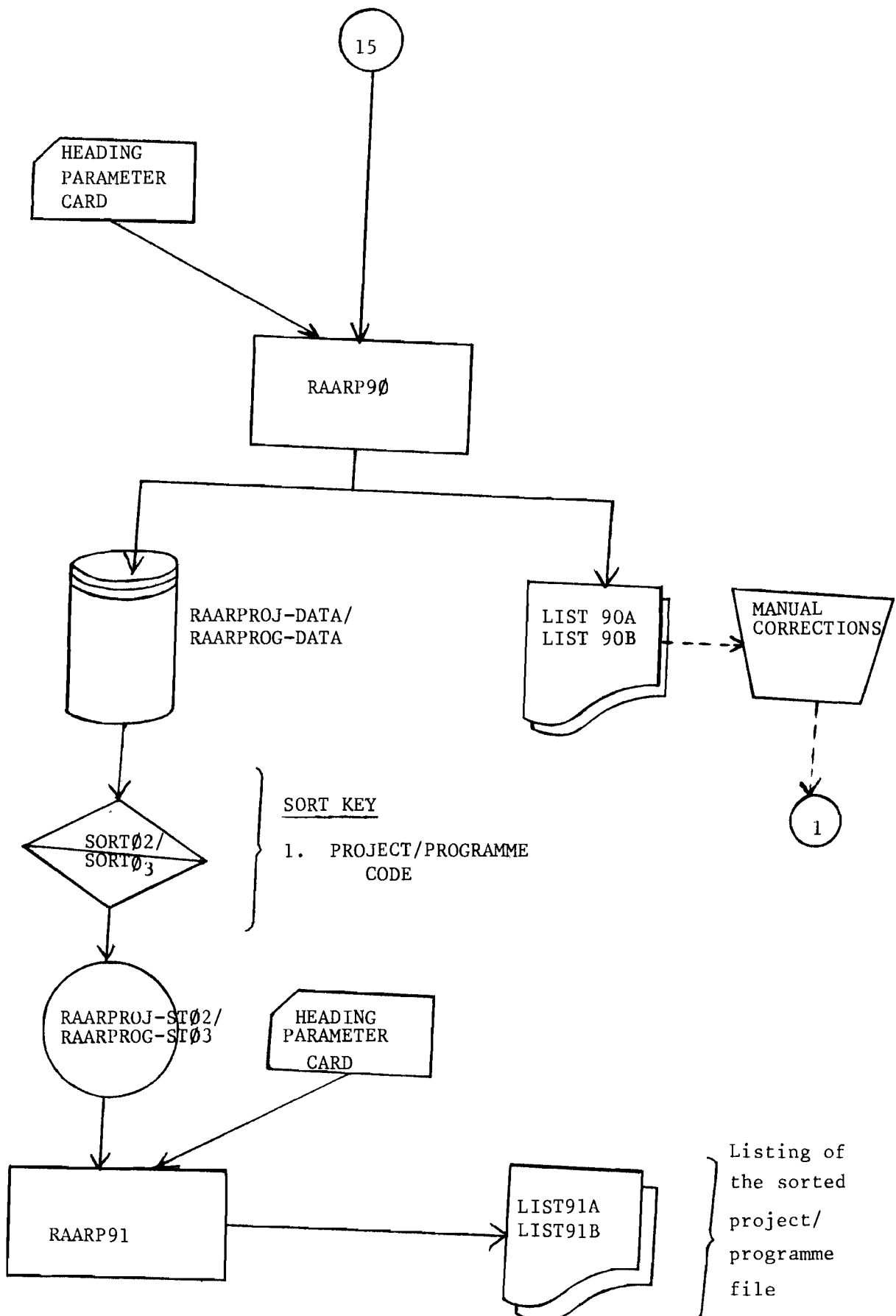
LIST 83 (JOB NAME RAART 83)



LIST 84 (JOB NAME RAART 84)



LIST 90A, 90B (JOB NAME RAART90)
 LIST 91A, 91B (JOB NAME RAART91)



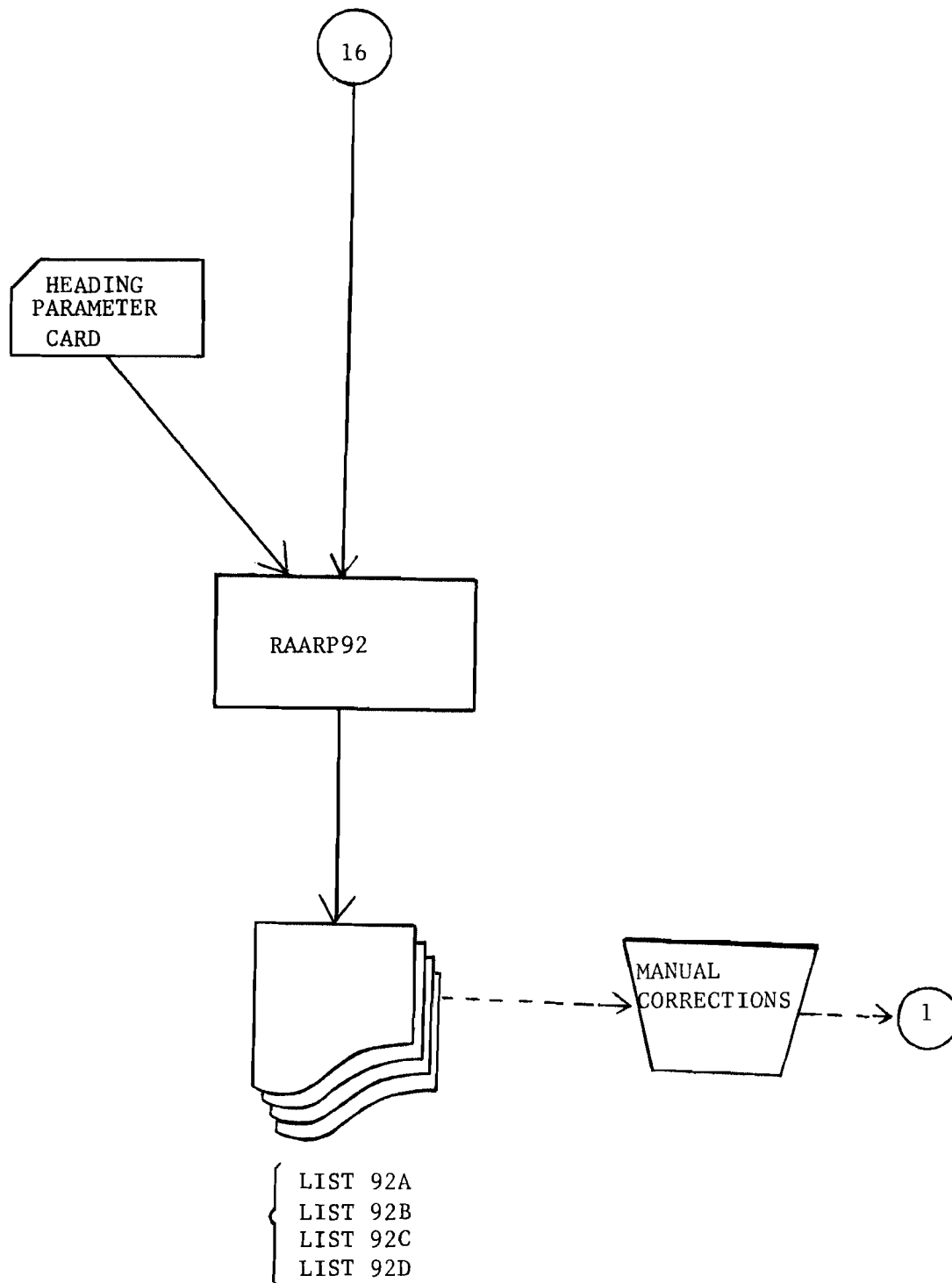


TABLE 01A (JOB NAME RAART01A)

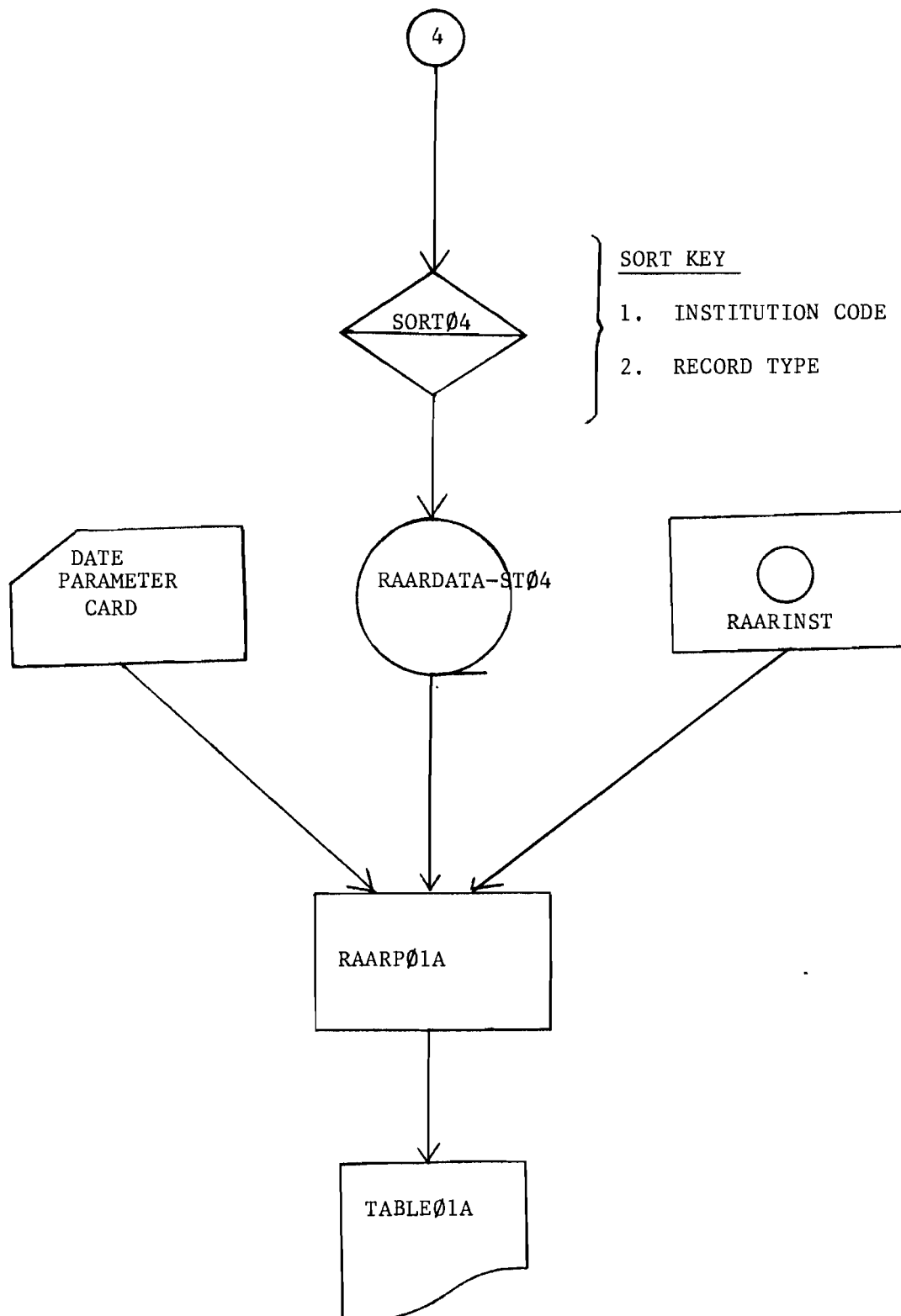


TABLE 01B (JOB NAME RAART01B)

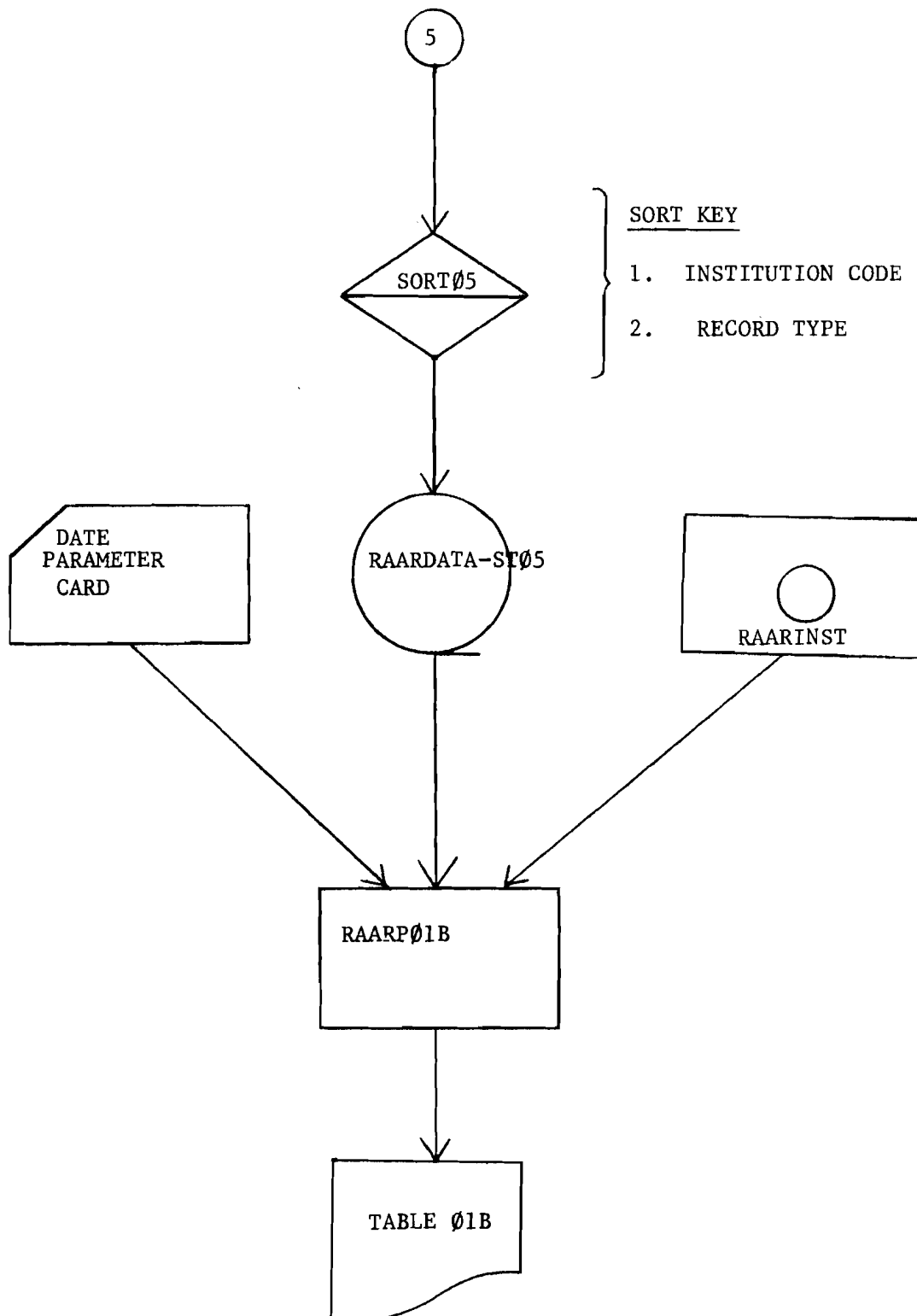


TABLE 02 (JOB NAME RAART 02)

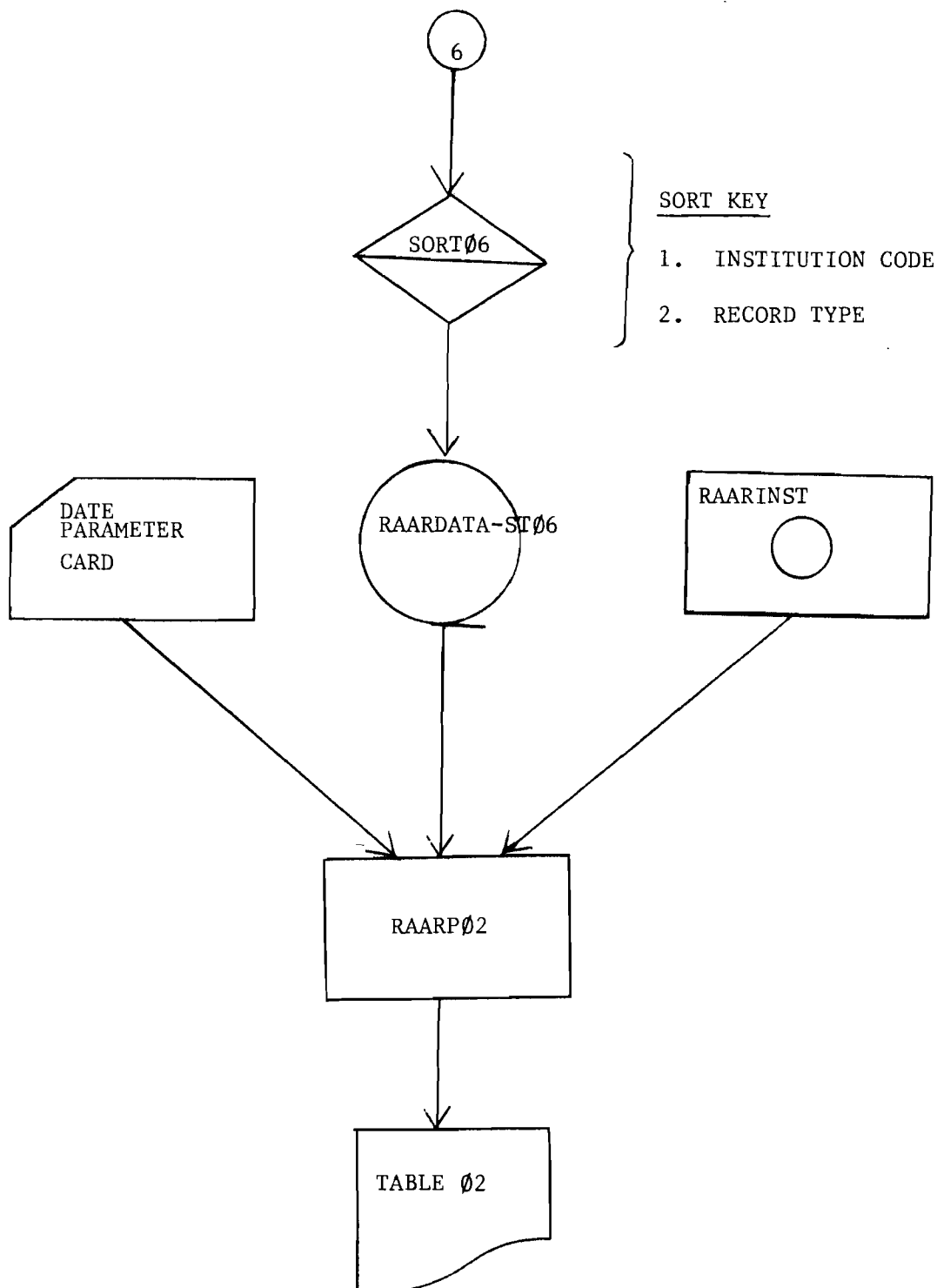


TABLE 03 (JOB NAME RAART 03)

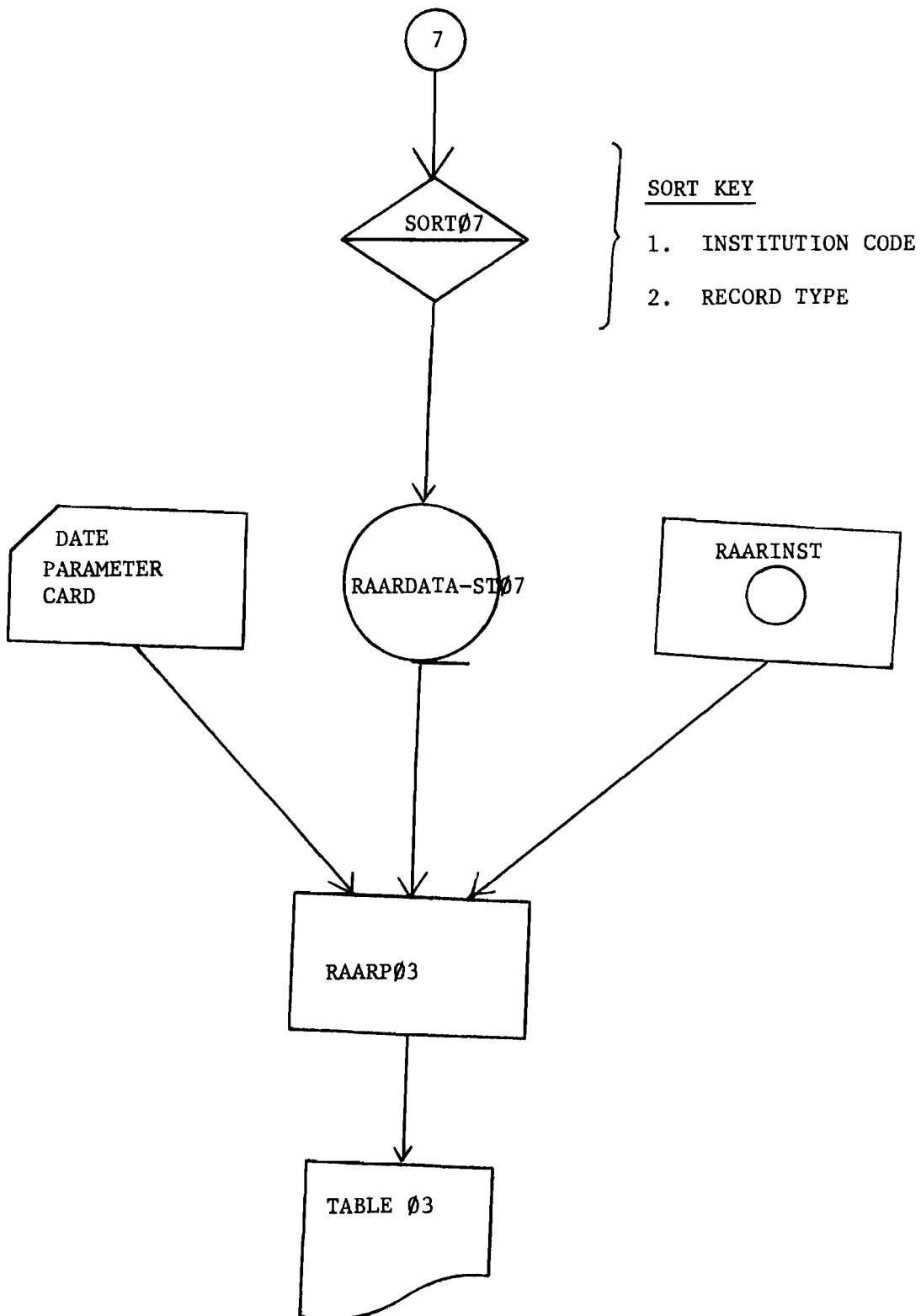


TABLE 04A (JOB NAME RAART 04A)

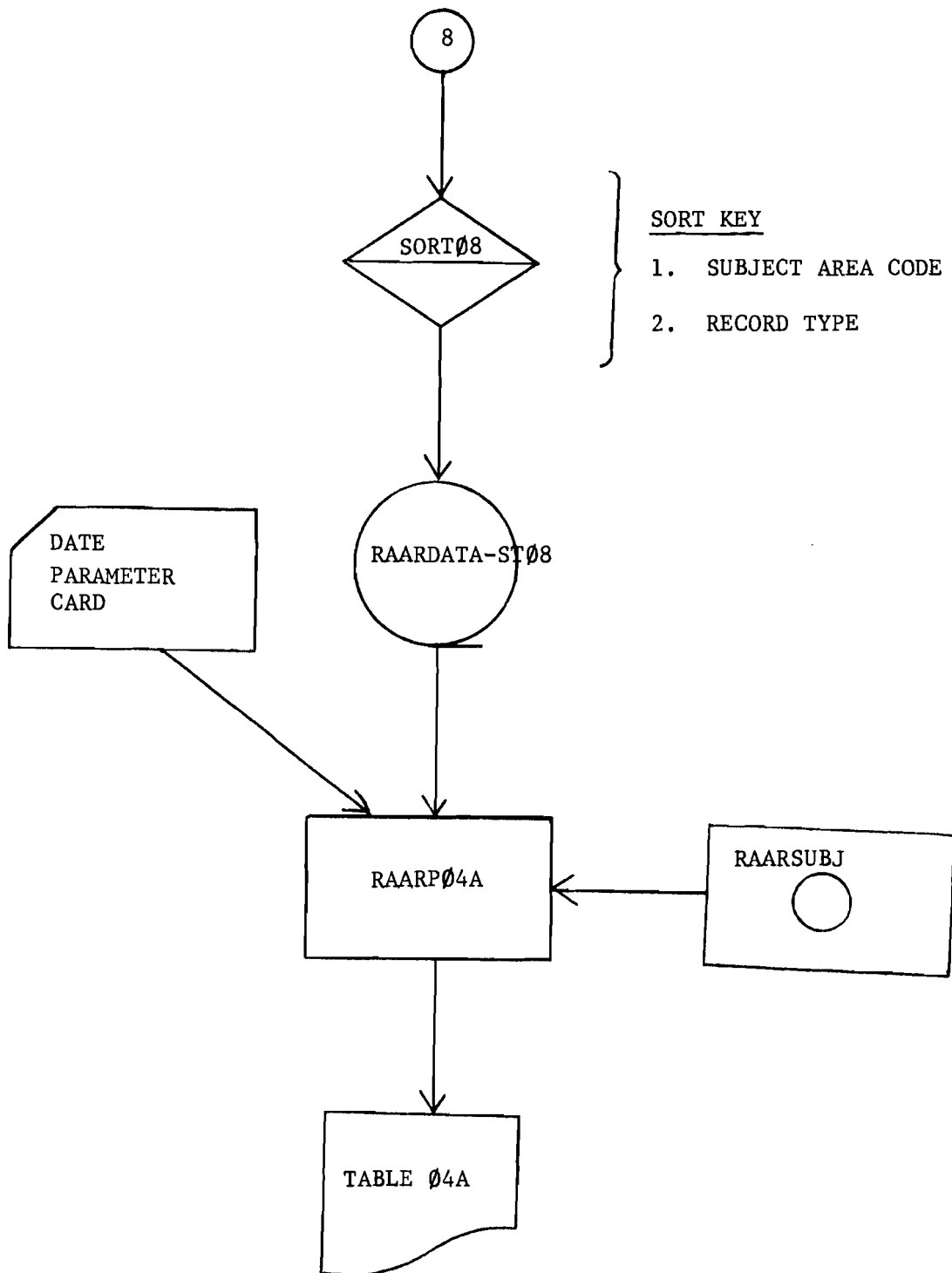


TABLE 04B (JOB NAME RAART04B)

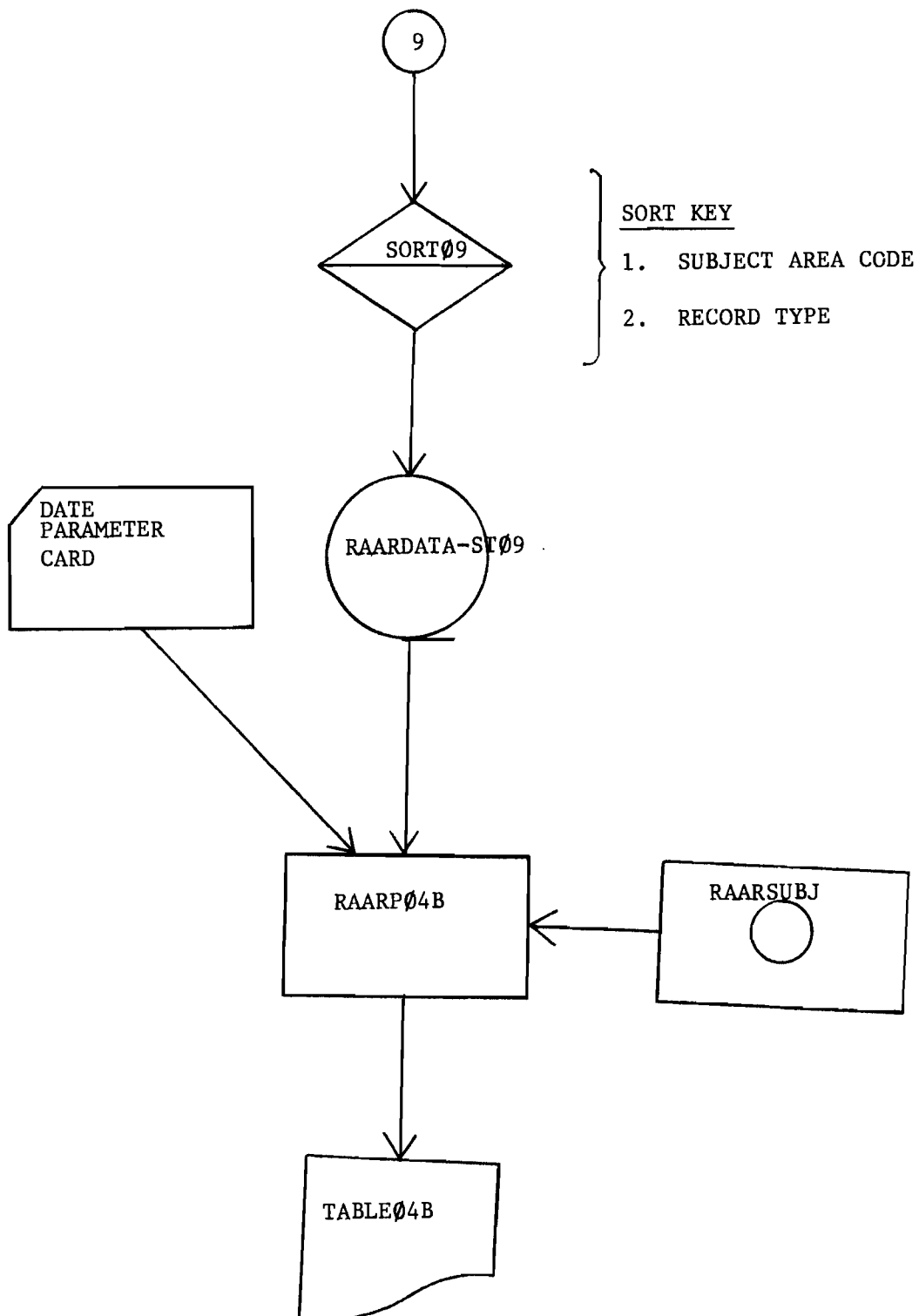


TABLE 05A AND 05B (JOB NAME RAART 05)

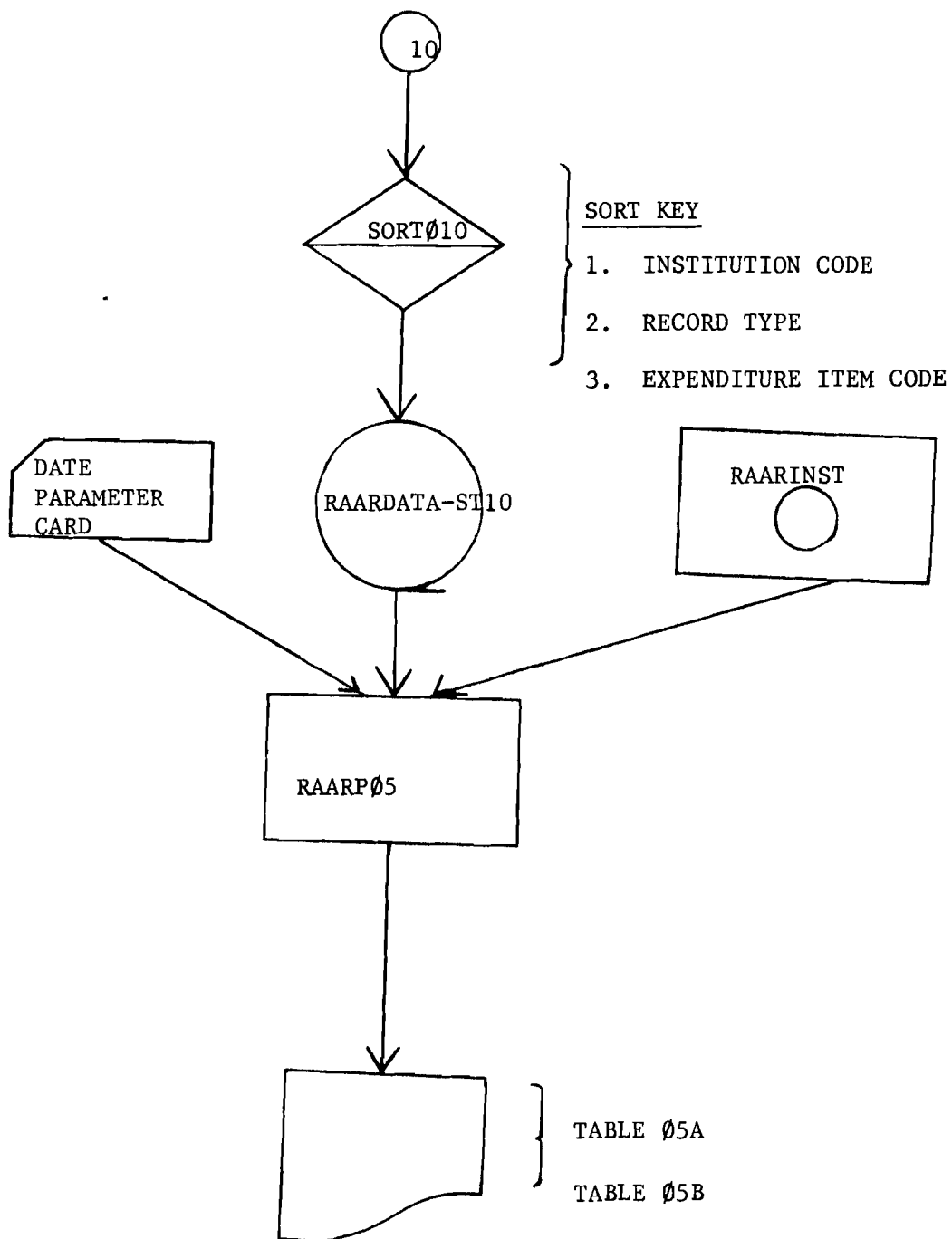


TABLE 06 (JOB NAME RAART 06)

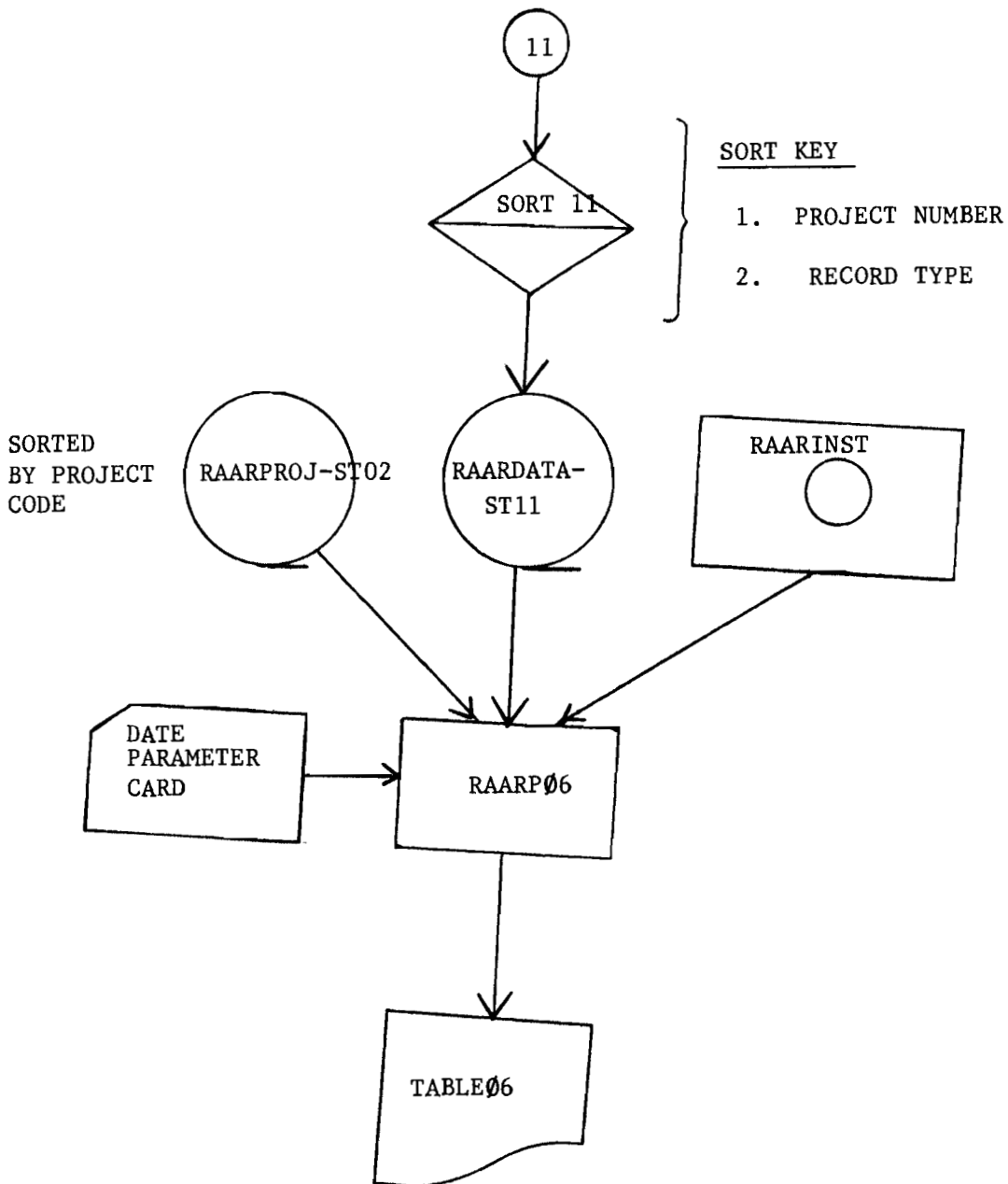


TABLE 07 (JOB NAME RAART07)

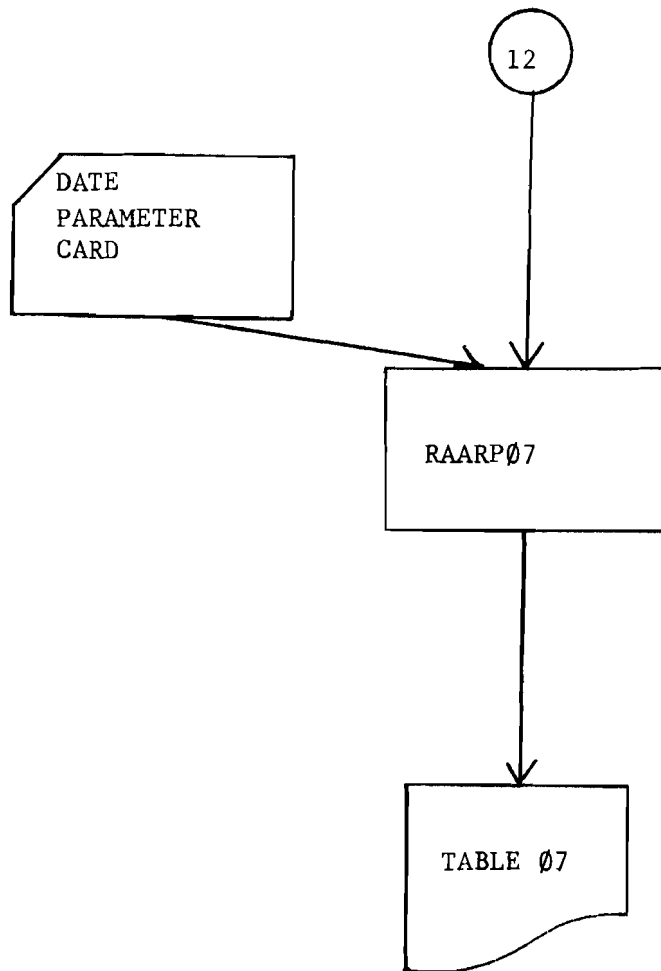
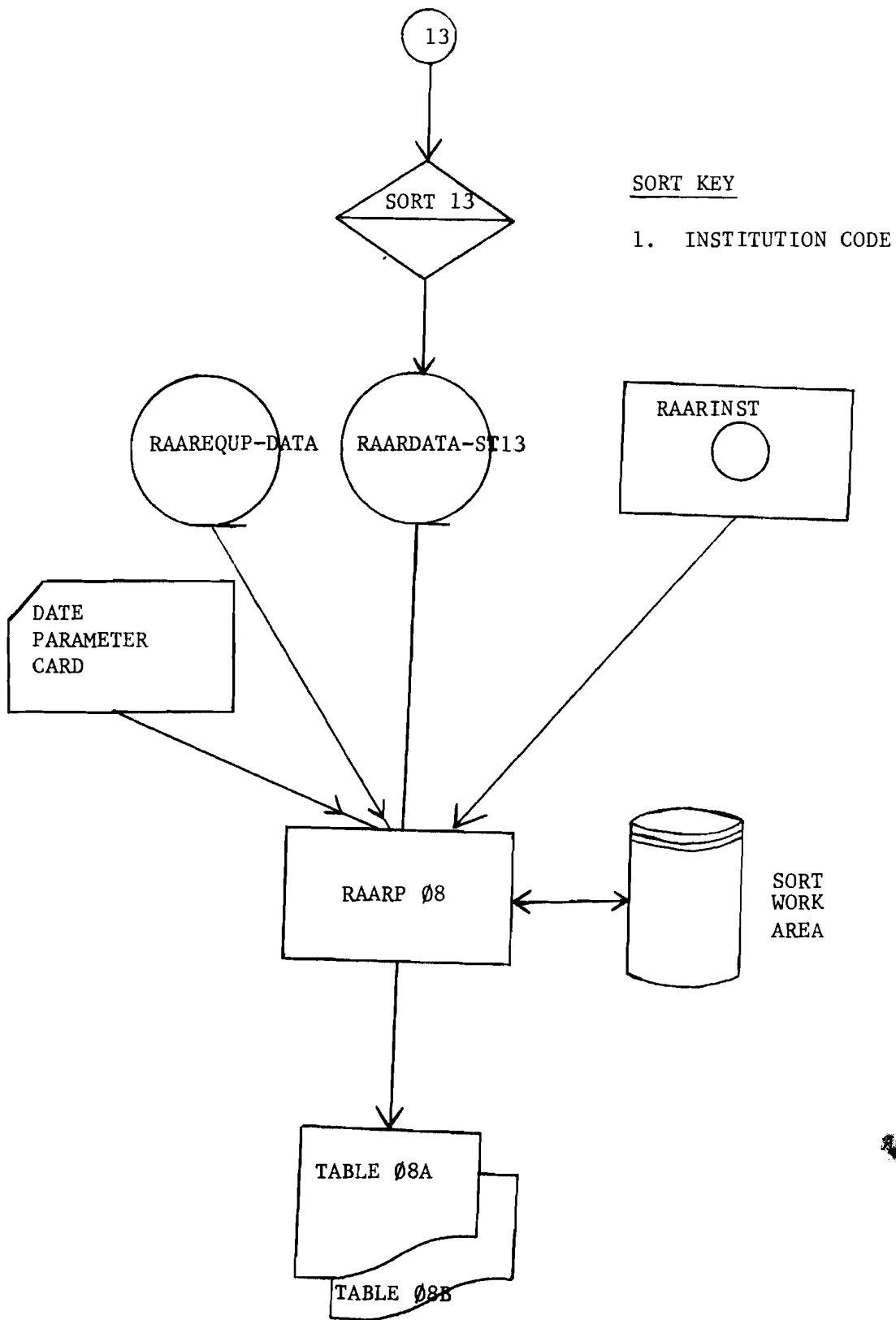


TABLE 08A AND 08B (JOB NAME RAART 08)



B) SOURCES OF DATA

2.2 The input data to the system is keyed from three distinct questionnaire forms - 'A', 'B' and 'C', containing a wide variety of coded information and altogether in thirteen (13) different types of records.

(i) FORM A - INSTITUTIONAL RESOURCES

2.3 This form is filled by the Director of a particular institution and contains five (5) record types:-

- Record type 01 gives the identity of the Institution, and includes information on the name of the institution and the director, the location, land area under the institution and ecological zones of the stations;
- Record type 02 gives information in respect of manpower. This includes Scientific manpower, Technical support staff and other support staff;
- Record type 03 gives information in respect of recurrent and development expenditure;
- Record type 04 contains the budgeting system which gives detailed expenditure by item, while
- Record type 05 gives information in respect of Technical assistance.

(ii) FORM B - PROJECT IDENTIFICATION

2.4 Form B is filled by the Principal investigators and contains information for the identification of each programme and project under study. There are seven (7) record types contained in this form:-

- Record type 06 gives the programme and project identification, project justification (that is current level of production of commodity under research, estimated potential production and technical factors limiting production, major findings of past research), and other institutions cooperating in the project.
- Record type 07 gives the existing experimental sites, whereas
- Record type 08 contains the proposed experimental sites.

- Record type 09 gives information in respect of project personnel and this to include the name, qualifications, research experience and nationality of the principal investigator and other scientists.
- Record type 10 gives the number of technical staff in post - Kenyan and other nationalities, the number of vacant posts and total number of staff required; this record also gives similar information about the other support staff.
- Record type 11 and 12 gives information about the project costs, that is recurrent and capital costs. The recurrent cost include such items as personnel, operating and other costs both local and aid; whereas the capital cost includes the purchase of major laboratory equipment, quantity acquired and the year of purchase, condition and percentage use and replacement cost. There is also information about the duration of the project.

(iii) FORM C: SYSTEM OF RESOURCE ALLOCATION

2.5 Questionnaire form 'C' is filled by various levels of management and it contains thirteen (13) types of questions aimed at evaluating the management system of the resources in research institutions. The responses, which are in the form of 'yes' and 'no' answers are coded in record type 13 as '1' and '0' respectively.

If the answer is a 'yes' the respondent enters a '1' in the relevant space in the questionnaire and it is a 'no' then a '0' response is entered. On the coding section of the questionnaire a '1' response is coded as a '1' while a '0' is coded as a '0' or left blank. This record also contains the name of the Institution and the name and designation of the interviewee.

C) FILE DESCRIPTION

(i) MAIN DATA FILE

2.6 The main input master file is 'RAARDATA' and is maintained on computer magnetic tape. The master file contains data pertaining to all the thirteen record types which have been keyed from the three different types of questionnaire forms 'A', 'B' and 'C'. The above data is keyed onto separate diskettes according to type of form. Data on the diskettes is transferred on to magnetic tape so that it is in the sequence of Form A, B and C by using programme 'RAARP80'.

During this process the program picks the programme and project numbers from record type 06 and duplicates them into record type 07 through 12 which are within the same Form 'B' booklet. The program also performs some validity checks on institution field, subject field, and record type field. Erroneous records are rejected and a printout produced. This program also generates a unique batch number for all records contained in each form 'B' booklet.

a) DISKETTE RECORD LAYOUTS

RECORD LENGTH = 128 CHARACTERS

2.7 RECORD TYPE 01

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	x
4.	RECORD TYPE	7-8	9(02)
5.	NAME OF DIRECTOR	9-23	X(15)
6.	QUALIFICATIONS	24-33	9(02) OCCURS 5
7.	PROVINCE CODE	34-35	9(02)
8.	DISTRICT CODE	36	9
9.	HECTARES (TOTAL)	37-41	9(05)
10.	MAIN STATION HECTARES	42-46	9(05)
11.	MAIN STATION ECOZONE	47	9
12.	SUBSTATIONS HECTARES + ECOZONE	48-83	9(06) OCCURS 6
13.	FILLER	84-128	X(45)

2.8 RECORD TYPE 02

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	PHD MAN YEARS	9-28	9(02) OCCURS 10
6.	MSC MAN YEARS	29-48	9(02) OCCURS 10
7.	BSC MAN YEARS	49-68	9(02) OCCURS 10
8.	SENIOR TECHNOLOGIST MAN YEARS	69-70	9(02)

9.	TECHNOLOGIST MAN YEARS	71-72	9(Ø2)
10.	TECHNICIAN MAN YEARS	73-74	9(Ø2)
11.	EXECUTIVE MAN YEARS	75-76	9(Ø2)
12.	CLERICAL/SECRETARY	77-78	9(Ø2)
13.	DRIVER/ARTISAN	79-80	9(Ø2)
14.	UNSKILLED LABOUR	81-83	9(Ø3)
15.	FILLER	84-128	X(45)

2.9 RECORD TYPE Ø31

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-9	9(Ø3)
5.	RECURRENT AMOUNT	10-81	9(Ø7) OCCURS 1Ø
6.	FILLER	82-128	X(47)

2.10 RECORD TYPE Ø32

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-9	9(Ø3)
5.	DEVELOPMENT AMOUNT	10-81	9(Ø7) OCCURS 1Ø
6.	FILLER	82-128	X(47)

2.11 RECORD TYPE Ø4

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	BUDGET ITEM CODE	9-11	9(Ø3)
6.	YEAR OF BUDGET	12-13	99
7.	REQUESTED BUDGET	14-20	9(Ø7)
8.	APPROVED BUDGET	21-27	9(Ø7)
9.	ACTUAL EXPENDITURE	28-34	9(Ø7)
10.	FILLER	35-128	X(94)

2.12 RECORD TYPE 05

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	BUDGET YEAR	9-10	9(02)
6.	ACTUAL EXPENDITURE	11-17	9(07)
7.	YEAR OF BUDGET	18-19	9(02)
8.	ACTUAL EXPENDITURE	20-26	9(07)
9.	FILLER	27-128	X(102)

2.13 RECORD TYPE 06

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	PROGRAMME NUMBER	9-23	9(15)
6.	PROJECT NUMBER	24-38	9(15)
7.	COMMODITY	39	9
8.	UNITS	40-45	9(6)
9.	COMMODITY	46	9
10.	UNITS	47-52	9(06)
11.	TECHNICAL FACTORS	53-70	9(02) OCCURS 9
12.	OTHER INSTITUTIONS	71-88	9(03) OCCURS 6
13.	FILLER	89-128	X(40)

2.14 RECORD TYPE 07

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	NUMBER OF OCCURRENCE OF EXISTING SITES	9	9
6.	SITE LOCATIONS	10-49	9(05) OCCURS 8
6.1	SITE		9
6.2	PROVINCE		9(02)
6.3	DISTRICT		9
6.4	ECOZONE		9
7.	FILLER	50-128	X(79)

2.15 RECORD TYPE 08

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	NUMBER OF OCCURENCE OF PROPOSED SITES	9	9
6.	SITE LOCATIONS	10-49	9(05) OCCURS 8
6.1	SITE		9
6.2	PROVINCE		9(02)
6.3	DISTRICT		9
6.4	ECOZONE		9
7.	FILLER	50-128	X(79)

2.16 RECORD TYPE 09

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	FIELD IDENTIFIER	9	9
6.	FIELD OF RESEARCH	10-11	9(02)
7.	NAME OF INVESTIGATOR	12-26	9(15)
8.	QUALIFICATIONS	27-36	9(02) OCCURS 5
9.	RESEARCH EXPERIENCE	37-38	9(02)
10.	NATIONALITY	39-40	9(02)
11.	% TIME	41 43	9(03)
12.	FILLER	44-128	X(85)

2.17 RECORD TYPE 10

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	STAFF	9-48	OCCURS 4
5.1	STAFF IN POST		9(02)
5.2	KENYANS		9(02)
5.3	OTHER NATIONALITIES		9(02)
5.4	VACANT POSTS		9(02)
5.5	NUMBER REQUIRED		9(02)
6.	FILLER	49-128	X(80)

2.18 RECORD TYPE 11

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	PERSONNEL COST (LOCAL)	9-15	9(Ø7)
6.	PERSONNEL COST (AID)	16-22	9(Ø7)
7.	OPERATING COST (LOCAL)	23-29	9(Ø7)
8.	OPERATING COST (AID)	30-36	9(Ø7)
9.	FILLER	37-128	X(92)

2.19 RECORD TYPE 12

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	CAPITAL COST	9-93	OCCURS 5
5.1	EQUIPMENT DESCRIPTION		9(Ø2)
5.2	QUANTITY		9(Ø2)
5.3	YEAR OF PURCHASE		9(Ø2)
5.4	CONDITION		9
5.5	% USE		9(Ø3)
5.6	REPLACEMENT COST		9(Ø7)
6.	LAB/OFFICE SPACE	94	9
7.	YEAR PROJECT STARTED	95-96	9(Ø2)
8.	YEAR PROJECT ENDED	97-98	9(Ø2)
9.	FILLER	99-128	X(3Ø)

2.20 RECORD TYPE 13

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	DESCRIPTION OF INTERVIEWEE	9	9
6.	QUESTION - 1	1Ø-15	9 OCCURS 6
7.	QUESTION - 2	16-25	9 OCCURS 1Ø

8.	QUESTION - 3	26-29	9 OCCURS 4
9.	QUESTION - 4	30-34	9 OCCURS 5
10.	QUESTION - 5	35-38	9 OCCURS 4
11.	QUESTION - 6	39-40	9 OCCURS 2
12.	QUESTION - 7	41-45	9 OCCURS 5
13.	QUESTION - 8	46-51	9 OCCURS 6
14.	QUESTION - 9	52-55	9 OCCURS 4
15.	QUESTION - 10	56-60	9 OCCURS 5
16.	QUESTION - 11	61-64	9 OCCURS 4
17.	QUESTION - 12	65-69	9 OCCURS 5
18.	QUESTION - 13	70-72	9 OCCURS 3
19.	FILLER	73-128	X(56)

b) MAGNETIC TAPE RECORD LAYOUT

LABEL = RAARDATA
RECORD LENGTH = 128 CH
BLOCK SIZE = 7000 CH

2.21 RECORD TYPE 01

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	NAME OF DIRECTOR	9-23	X(15)
6.	QUALIFICATIONS	24-33	9(02) OCCURS 5
7.	PROVINCE CODE	34-35	9(02)
8.	DISTRICT CODE	36	9
9.	HECTARES (TOTAL)	37-41	9(05)
10.	MAIN STATION HECTARES	42-46	9(05)
11.	MAIN STATION ECOZONE	47	9
12.	SUBSTATIONS HECTARES + ECOZONE	48-83	9(06) OCCURS 6
13.	FILLER	84-140	X(57)

2.22 RECORD TYPE 02

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)

5.	PHD MAN YEARS	9-28	9(02) OCCURS 10
6.	MSC MAN YEARS	29-48	9(02) OCCURS 10
7.	BSC MAN YEARS	49-68	9(02) OCCURS 10
8.	SENIOR TECHNOLOGIST MAN YEARS	69-70	9(02)
9.	TECHNICIAN MAN YEARS	73-74	9(02)
10.	EXECUTIVE MAN YEARS	75-76	9(02)
11.	DRIVER/ARTISAN	79-80	9(02)
12.	UNSKILLED LABOUR	81-83	9(03)
13.	FILLER	84-140	X(57)

2.23 RECORD TYPE 031

1.	INSTITUTION CODE	1-3	9(03)
2.	YEARS OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-9	9(03)
5.	RECURRENT AMOUNT	10-81	9(07) OCCURS 10
6.	FILLER	82-140	X(59)

2.24 RECORD TYPE 032

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-9	9(03)
5.	DEVELOPMENT AMOUNT	10-81	9(07) OCCURS 10
6.	FILLER	82-140	X(59)

2.25 RECORD TYPE 04

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	BUDGET ITEM CODE	9-11	9(03)
6.	YEAR OF BUDGET	12-13	99
7.	REQUESTED BUDGET	14-20	9(07)
8.	APPROVED BUDGET	21-27	9(07)
9.	ACTUAL EXPENDITURE	28-34	9(07)
10.	FILLER	35-140	X(106)

2.26 RECORD TYPE Ø5

1.	INSTITUTION CODE	1-9	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	BUDGET YEAR	9-10	9(Ø2)
6.	ACTUAL EXPENDITURE	11-17	9(Ø7)
7.	YEAR OF BUDGET	18-19	9(Ø2)
8.	ACTUAL EXPENDITURE	20-26	9(Ø7)
9.	FILLER	27-140	X(114)

2.27 RECORD TYPE Ø6

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	PROGRAMME NUMBER	9-23	9(15)
6.	PROJECT NUMBER	24-38	9(15)
7.	COMMODITY	39	9
8.	UNITS	40-45	9(6)
9.	COMMODITY	46	9
10.	UNITS	47-52	9(Ø6)
11.	TECHNICAL FACTORS	53-70	9(Ø2) OCCURS 9
12.	OTHER INSTITUTIONS	71-88	9(Ø3) OCCURS 6
13.	FILLER	89-130	X(42)
14.	BATCH No.	131-133	9(Ø3)
15.	FILLER	134-140	X(7)

2.28 RECORD TYPE Ø7

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	FIELD OF OCCURRENCE OF EXISTING SIZES	9	9
6.	SIZE LOCATIONS	10-49	9(Ø5) OCCURS 8
6.1	SITE		9
6.2	PROVINCE		9(Ø2)
6.3	DISTRICT		9
6.4	ECOZONE		9

7.	FILLER	50-100	X(51)
8.	PROGRAMME No.	101-115	X(15)
9.	PROJECT No.	116-130	X(15)
10.	BATCH No.	131-133	9(03)
11.	FILLER	134-140	X(07)

2.29 RECORD TYPE 08

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	FIELD OF OCCURENCE OF PROPOSED SITES	9	9
6.	SITE LOCATIONS	10-49	9(05) OCCURS 8
6.1	SITE		9
6.2	PROVINCE		9(02)
6.3	DISTRICT		9
6.4	ECOZONE		9
7.	FILLER	50-100	X(51)
8.	PROGRAMME No.	101-115	X(15)
9.	PROJECT No.	116-130	X(15)
10.	BATCH No.	131-133	9(03)
11.	FILLER	134-140	X(07)

2.30 RECORD TYPE 09

1.	INSTITUTION CODE	1-3	9(03)
2.	YEAR OF SURVEY	4-5	9(02)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(02)
5.	FIELD IDENTIFIER	9	9
6.	FIELD OF RESEARCH	10-11	9(02)
7.	NAME OF INVESTIGATOR	12-26	9(15)
8.	QUALIFICATIONS	27-36	9(02) OCCURS 5
9.	RESEARCH EXPERIENCE	37-38	9(02)
10.	NATIONALITY	39-40	9(02)
11.	% TIME	41-43	9(03)
12.	FILLER	44-100	X(57)

13.	PROGRAMME No.	101-115	X(15)
14.	PROJECT No.	116-130	X(15)
15.	BATCH No.	131-133	9(Ø3)
16.	FILLER	134-140	X(Ø7)

2.31 RECORD TYPE 1Ø

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	STAFFING POST	9-1Ø	9(Ø2)
6.	KENYANS	11-12	9(Ø2)
7.	OTHER NATIONALITIES	13-14	9(Ø2)
8.	VACANT POSTS	15-16	9(Ø2)
9.	NUMBER REQUIRED	17-18	9(Ø2)
10.	VACANCIES (POSTS)	19-48	9(1Ø) OCCURS 3
10.1	STAFF POST		9(Ø2)
10.2	KENYANS		9(Ø2)
10.3	OTHER NATIONALITIES		9(Ø2)
10.4	VACANT POSTS		9(Ø2)
10.5	NUMBER REQUIRED		9(Ø2)
11.	FILLER	49-100	X(52)
12.	PROGRAMME No.	101-115	X(15)
13.	PROJECT No.	116-130	X(15)
14.	BATCH No.	131-133	9(Ø3)
15.	FILLER	134-140	X(Ø7)

2.32 RECORD TYPE 11

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	PERSONNEL COST (LOCAL)	9-15	9(Ø7)
6.	PERSONNEL COST (AID)	16-22	9(Ø7)
7.	OPERATING COST (LOCAL)	23-29	9(Ø7)
8.	OPERATING COST (AID)	30-36	9(Ø7)
9.	FILLER	37-100	X(64)
10.	PROGRAMME No.	101-115	X(15)
11.	PROJECT No.	116-130	X(15)

12.	BATCH No.	131-133	9(Ø3)
13.	FILLER	134-140	X(Ø7)

2.33 RECORD TYPE 12

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	CAPITAL COST	9-93	9(17) OCCURS
5.1	EQUIPMENT DESCRIPTION		9(Ø2)
5.2	QUANTITY		9(Ø2)
5.3	YEAR OF PURCHASE		9(Ø2)
5.4	CONDITION		9
5.5	% USE		9(Ø3)
5.6	REPLACEMENT COST		9(Ø7)
6.	LAB/OFFICE	94	9
7.	YEAR PROJECT STARTED	95-96	9(Ø2)
8.	YEAR PROJECT ENDED	97-98	9(Ø2)
9.	FILLER	99-100	XX
10.	PROGRAMME No.	101-115	X(15)
11.	PROJECT No.	116-130	X(15)
12.	BATCH No.	131-133	9(Ø3)
13.	FILLER	134-140	X(Ø7)

2.34 RECORD TYPE 13

1.	INSTITUTION CODE	1-3	9(Ø3)
2.	YEAR OF SURVEY	4-5	9(Ø2)
3.	BLANK	6	X
4.	RECORD TYPE	7-8	9(Ø2)
5.	DESCRIPTION OF INTERVIEWEE	9	9
6.	QUESTION - 1	10-15	9(01) OCCURS 6
7.	QUESTION - 2	16-25	9 OCCURS 10
8.	QUESTION - 3	26-29	9 OCCURS 4
9.	QUESTION - 4	30-34	9 OCCURS 5
10.	QUESTION - 5	35-38	9 OCCURS 4
11.	QUESTION - 6	39-40	9 OCCURS 2
12.	QUESTION - 7	41-45	9 OCCURS 5
13.	QUESTION - 8	44-57	9 OCCURS 6
14.	QUESTION - 9	52-58	9 OCCURS 4

15.	QUESTION - 10	56-60	9 OCCURS 5
16.	QUESTION - 11	61-64	9 OCCURS 4
17.	QUESTION - 12	65-69	9 OCCURS 5
18.	QUESTION - 13	70-72	9 OCCURS 3
19.	FILLER	73-140	X(68)

ii) DICTIONARY FILES

2.35 The following dictionary files are also maintained in the system.

a) Institution Dictionary File (RAARINST)

2.36 This file contains the institutions name and code, and is maintained on diskette. The file is used by various programmes which produce institutions tabulations.

RAARINST. DISKETTE RECORD LAYOUT

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	INSTITUTION CODE	1-3	9(03)
2.	FILLER	4	X
3.	INSTITUTION NAME	5-80	X(76)

b) Subject Areas Dictionary File (RAARSUBJ)

2.37 This file contains the subject area code and the name of the subject area. This file is also maintained on diskette and is used by various programmes which produce analysis tables by subject area.

RAARSUBJ. DISKETTE RECORD LAYOUT

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	SUBJECT AREA CODE	1-3	9(03)
2.	FILLER	4	X
3.	SUBJECT AREA NAME	5-80	X(76)

c) Project Dictionary File (RAARPROJ)

2.38 This file is maintained on both diskette and magnetic tape because of the large volume of the data involved. The file contains project names and corresponding codes.

This file is used by the programmes that produce tabulations analysed by project number.

RAARPROJ DISKETTE RECORD LAYOUT

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	PROJECT CODE	1-15	9(15)
2.	FILLER	16	X
3.	PROJECT NAME	17-80	X(64)

RAARPROJ-DATA MAGNETIC TAPE RECORD LAYOUT

RECORD LENGTH = 80

BLOCK SIZE = 8000

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	PROJECT CODE	1-15	9(15)
2.	FILLER	16	X
3.	PROJECT NAME	17-80	X(64)

d) Programme Dictionary File (RAARPROG)

2.39 This file contains programme names and code numbers, and is maintained on diskette.

RAARPROG. DISKETTE RECORD LAYOUT

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	PROGRAMME CODE	1-15	9(15)
2.	FILLER	16	X
3.	PROGRAMME NAME	17-80	X(64)

e) Fields of Research Dictionary File (RAARFLDS)

2.40 This file contains the names of fields of research and their code numbers. It is maintained on diskette.

RAARFLDS DISKETTE RECORD LAYOUT

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	FIELD CODE	1-2	9(Ø2)
2.	FILLER	3	X
3.	FIELD NAME	4-80	X(77)

f) Major Laboratory Equipment Dictionary File (RAAREQUP)

2.41 This is the major laboratory equipment file and it contains equipment code numbers and description. It is maintained on diskette and magnetic tape.

RAAREQUP DISKETTE RECORD LAYOUT

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	EQUIPMENT CODE	1-2	9(Ø2)
2.	FILLER	3	X
3.	EQUIPMENT NAME	4-80	X(77)

RAAREQUP-DATA MAGNETIC TAPE RECORD LAYOUT

BLOCK SIZE = 8000

RECORD LENGTH = 80

<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>PICTURE</u>
1.	EQUIPMENT CODE	1-2	9(Ø2)
2.	FILLER	3	X
3.	EQUIPMENT NAME	4-80	X(77)

CHAPTER III

PROGRAM SPECIFICATIONS

- 3.1 There are about 18 Cobol programs which make up the system; each producing various tables as required. These programs are appropriately numbered and described in the following pages:-
- (A) GENERAL PROGRAMS
- 3.2 This section deals with general programs which are required by the system for the creation and listing of the dictionary and the main data files. All input data is keyed on floppy diskettes with record lengths of either 80 or 128 characters. If the keying length is 80 characters the file is loaded into the system as a Card file, but if the length is 128 then it is loaded as a disk or tape file.
- (i) PROGRAM RAARP80
- (a) Program Description
- 3.3 This is the program that reads the main data file keyed on diskettes and transfers the information to magnetic tape. The program also performs limited validity checks on the following:-
- Record type field - range 01 - 13
- Institution field - numeric
- Subject field - numeric
- If errors are detected a printout is produced and the record excluded from the output file.
- 3.4 Input - Main Data file keyed on Diskettes, of record length 128, and read as a disk file labelled RAARINPT.
(see 2.5 through 2.20)
- Output - 1) Magnetic tape containing the accepted data. Record length 140, Block size 50 Records per block labelled RAARDATA.
(see 2.21 through 2.34)

(2) Printout: LIST80 entitled 'ERROR LIST' (see Appendices II and III)

(b) Program Procedure

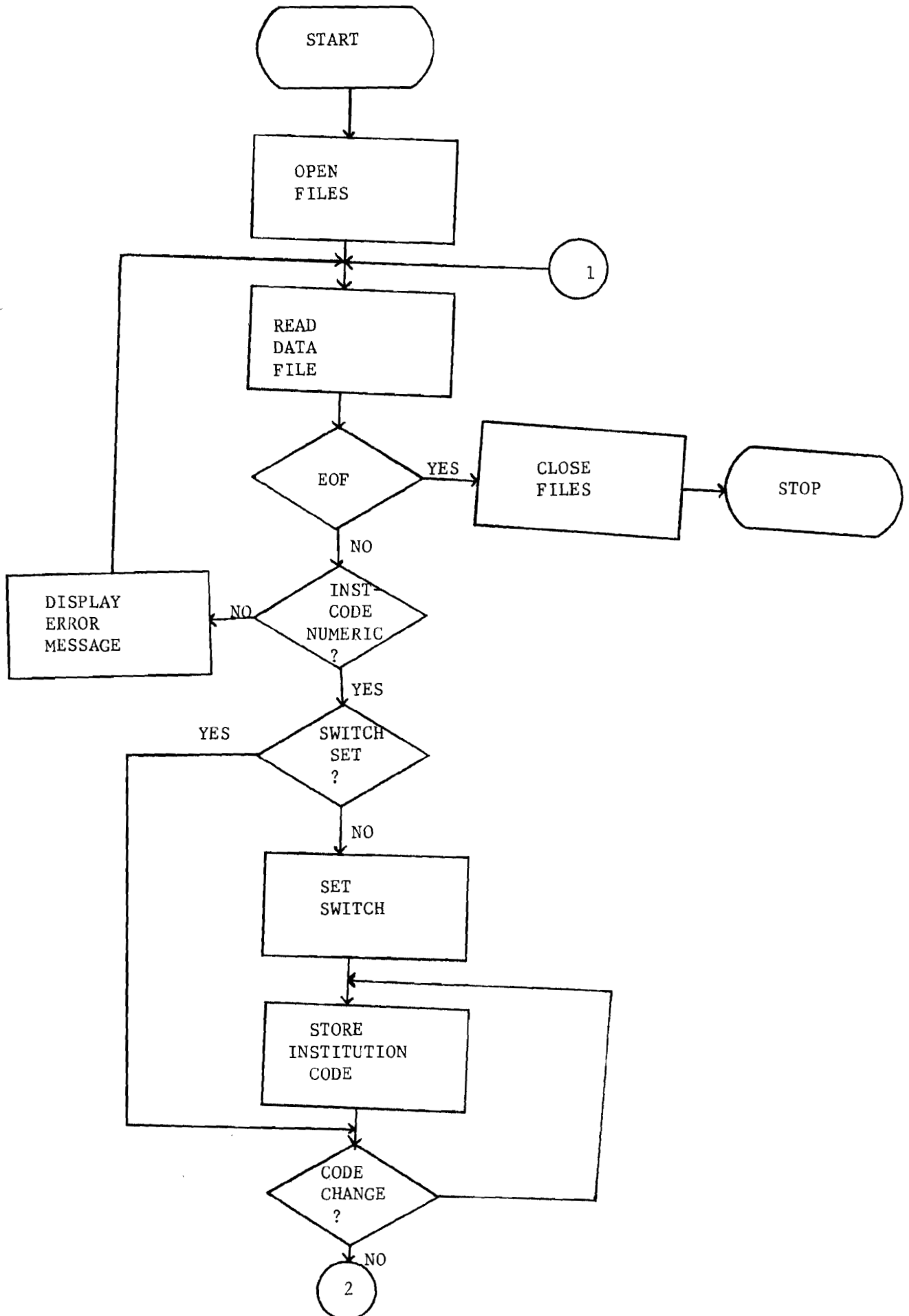
3.5 The program reads the input diskettes as a disk file and performs validations on record type field, institution code field and subject code field. If errors are detected in any one of those fields the record is rejected and a display printout is made along with appropriate message signifying the error which caused the rejection. Otherwise the program proceeds as follows:

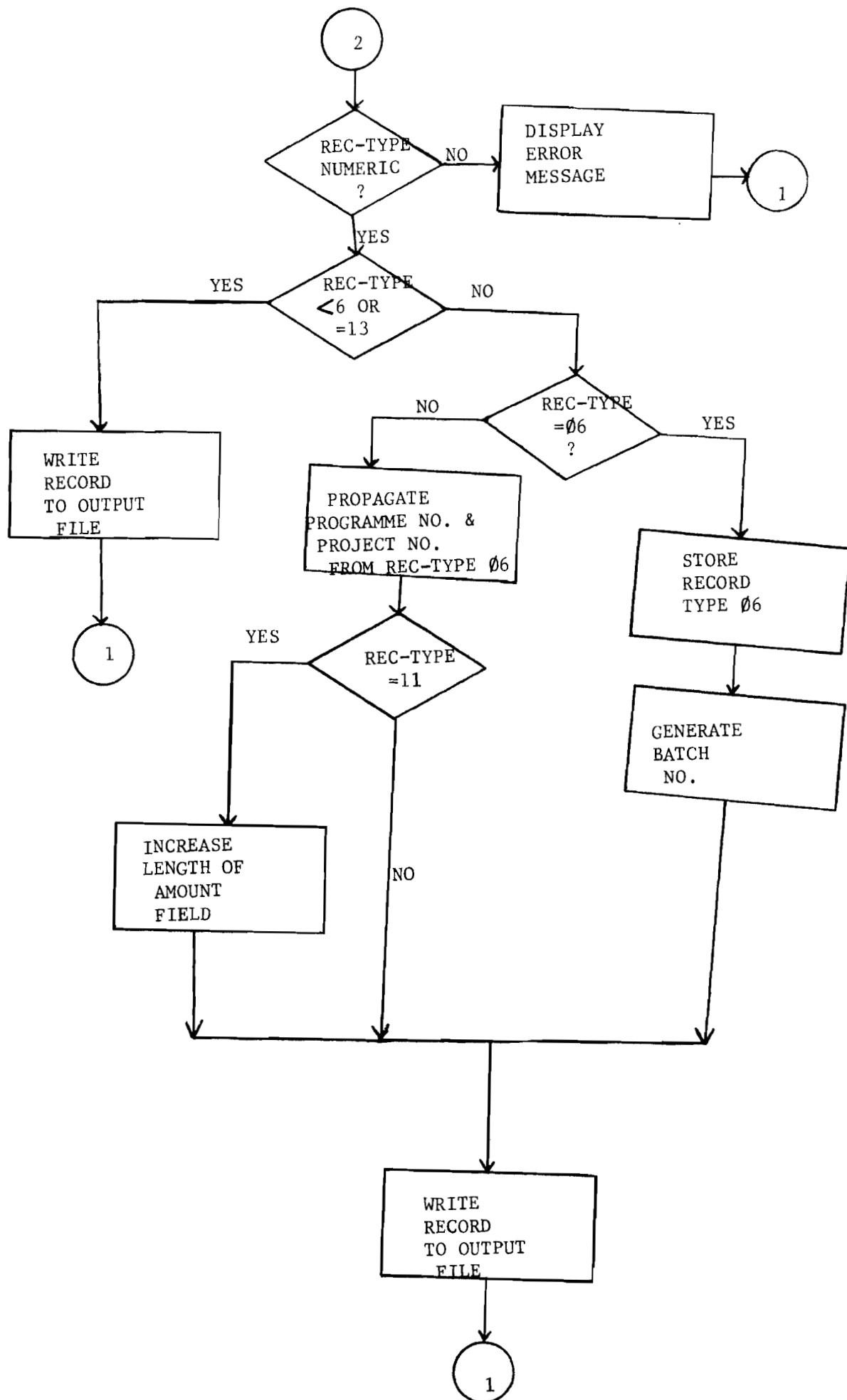
If the record types are less than 06 or equal to 13, they are written to the output magnetic tape without any further processing and the program goes on to read the next input record. If record type is equal to 06 the program number and the project number are stored for subsequent duplication into record types 07 through 12 of the same Form B booklet. The program also updates the batch number by increasing it by one. This batch number is also written into record type 06 before writing the latter away on to the output magnetic tape. After this the program reads the next record from the input file. If record types read are equal to 07 through 12 then the program duplicates into these records the following fields:-

- Program Number which was previously stored from record type 06 of the same booklet.
- Project number which was also stored from record type 06 of the same booklet.
- Batch number which was set to zero at the start of the run, and is subsequently increased by one each time record type 06 is encountered.

After adding these fields onto the appropriate record the latter is then written onto the output tape and the program reads the next record from the input file. This continues until all the records have been processed in accordance with the program whose flow chart and listing follow.

(c) PROGRAM FLOWCHART - RAARP80





(d) PROGRAM LISTING - RAARP80

```
* IS JOB JNM=RAARP80,CLASS=A,USER=OPS04000
// JJE RAARP80 DISKETTES TO TAPE
// LIBDEF CL,TJ=USRCL2
// OPTION CATAL
  PHASE RAARP80,*
// EXEC FCDBJL,SIZE=64K
CBL NOSEQ,CLIST, SXREF, FLOW=30, STATE
  IDENTIFICATION DIVISION.
  PROGRAM-ID. RAARP80.
  AUTHOR. CKC, AWK, AMK, NKM.
  ENVIRONMENT DIVISION.
  CONFIGURATION SECTION.
  SOURCE-COMPUTER. IBM-370.
  OBJECT-COMPUTER. IBM-370.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DISKETTEFL ASSIGN TO SYS001-DA-3540-S.
    SELECT TAPEFILE ASSIGN TO SYS002-JT-3420-S.
  DATA DIVISION.
  FILE SECTION.
    FD DISKETTEFL RECORDING MODE IS F
      BLOCK CONTAINS 1 RECORDS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS DISKETTEREC.
    *
    01 DISKETTEREC.
      02 FILLER PIC X(128).
    *
    FD TAPEFILE RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS TAPEREC.
    *
    01 TAPEREC.
      02 FILLER PIC X(140).
    *
  WORKING-STORAGE SECTION.
    77 BATCH-CT PIC 999 VALUE 0.
    77 SW1 PIC 9 VALUE 0.
    *
    01 WID-NO.
      02 INST-CODE PIC X(03).
      02 SURV-YEAR PIC XX.
      02 WREC-TYPE PIC 99.
    *
    01 WJRKREC.
      02 RINST-CODE PIC XXX.
      02 RSURV-YEAR PIC XX.
      02 FILLER PIC X.
      02 REC-TYPE-1 PIC XX.
      02 RREC-TYPE REDEFINES REC-TYPE-1 PIC 99.
      02 RREF-FLD-1.
        03 RREF-NO-1 PIC XXX.
        03 RCAT-1 PIC X.
        03 RSUBJ-1 PIC XXX.
        03 RFFDR-1 PIC XX.
        03 RYEAR-1 PIC XX.
        03 RSERIAL-1 PIC X(04).
        03 RREF-NO-2 PIC X(03).
        03 RCAT-2 PIC X.
        03 RSUBJ-2 PIC XXX.
        03 RFFDR-2 PIC XX.
        03 RYEAR-2 PIC XX.
        03 RSERIAL-2 PIC X(04).
      02 FILLER PIC X(90).
```

```

01 WORKREC-11 REDEFINES WORKREC.
02 FILLER PIC X(08).
02 AMT-FLD.
03 RPERS-LOCAL PIC X(05).
03 RPERS-LCL REDEFINES RPERS-LOCAL PIC 9(05).
03 RPERS-AID PIC X(05).
03 RPERS-AD REDEFINES RPERS-AID PIC 9(05).
03 ROPER-LOCAL PIC X(05).
03 ROPER-LCL REDEFINES ROPER-LOCAL PIC 9(05).
03 ROPER-AID PIC X(05).
03 ROPER-AD REDEFINES ROPER-AID PIC 9(05).
02 FILLER PIC X(100).

*
01 DJTREC-W.
02 INST-CODE-W PIC XXX.
02 SURV-YR-W PIC XX.
02 FILLER PIC X.
02 REC-TYPE-W PIC 99.
02 REF-FLD-2.
03 REF-NJ-1-W PIC XXX.
03 CAT-1-W PIC X.
03 SUBJ-1-W PIC XXX.
03 FFDR-1-W PIC XX.
03 YEAR-1-W PIC XX.
03 SERIAL-1-W PIC X(04).
03 REF-NJ-2-W PIC XXX.
03 CAT-2-W PIC X.
03 SUBJ-2-W PIC XXX.
03 FFDR-2-W PIC XX.
03 YEAR-2-W PIC XX.
03 SERIAL-2-W PIC X(04).
02 FILLER PIC X(62).
02 REF-FLD-3-W PIC X(30).
02 BATCH-NO-W PIC 999.
02 FILLER PIC X(07).

*
01 DJTREC-11 REDEFINES DJTREC-W.
02 FILLER PIC X(08).
02 PERS-LOCAL-O PIC 9(07).
02 PERS-AID-O PIC 9(07).
02 RPER-LOCAL-O PIC 9(07).
02 RPER-AID-O PIC 9(07).
02 FILLER PIC X(104).

*
01 STORE-REC.
02 SINST-CODE PIC XXX.
02 SSURV-YEAR PIC XX.
02 FILLER PIC X.
02 SREC-TYPE PIC 99.
02 SREF-FLD PIC X(30).
02 FILLER PIC X(90).

```



```

*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT  DISKETTEFL
    OUTPUT TAPEFILE.
    MOVE SPACES TO OUTREC-W.
P-READ.
    READ DISKETTEFL INTO WORKREC AT END GO TO P-END.
    IF RINST-CODE NOT NUMERIC DISPLAY 'ERR IN ID' WORKREC
        GO TO P-READ.
    IF SW1 = 1 GO TO P-COMPARE.
    MOVE 1 TO SW1.
P-STORE-ID.
    MOVE RINST-CODE TO INST-CODE.
    MOVE RSJRV-YEAR TO SURV-YEAR.
    MOVE RREC-TYPE TO WREC-TYPE.
*
    MOVE WORKREC TO STORE-REC.
*
P-COMPARE.
    IF RINST-CODE NOT = INST-CODE GO TO P-STORE-ID.
    IF REC-TYPE-1 NOT NUMERIC DISPLAY WORKREC GO TO P-READ.
    IF RREC-TYPE = 11 GO TO P-CHECK-11.
    IF RREC-TYPE > 5 GO TO P-CHECK-13.
*
P-MOVE.
    MOVE WORKREC TO OUTREC-W.
    WRITE TAPEREC FROM OUTREC-W.
    MOVE SPACES TO OUTREC-W.
    GO TO P-READ.
*
P-CHECK-11.
    IF RINST-CODE = SINST-CODE
        NEXT SENTENCE
    ELSE
        DISPLAY 'ERR IN ID' WORKREC
        GO TO P-READ.
    MOVE RINST-CODE TO INST-CODE-W.
    MOVE RSURV-YEAR TO SURV-YR-W.
    MOVE RREC-TYPE TO REC-TYPE-W.
    EXAMINE AMT-FLD REPLACING ALL SPACES BY ZEROS.
    IF (RINST-CODE = '040') AND (ROPER-LOCAL = '99999')
        MOVE 125000 TO OPER-LOCAL-O
    ELSE MOVE ROPER-LCL TO OPER-LOCAL-O.
    MOVE RPERS-LCL TO PERS-LOCAL-D.
    MOVE RPERS-AD TO PERS-AID-D.
    MOVE ROPER-AD TO OPER-AID-D.
    MOVE BATCH-CT TO BATCH-NO-W.
    MOVE SREF-FLD TO REF-FLD-G-W.
    WRITE TAPEREC FROM OUTREC-W.
    MOVE SPACES TO OUTREC-W.
    GO TO P-READ.

```

```

*
P-CHECK-13.
  IF RREC-TYPE = 13 GO TO P-MOVE.
  IF RREC-TYPE = 5  NEXT SENTENCE
    ELSE GO TO P-GENERATE.
  IF RSUBJ-1  NOT NUMERIC DISPLAY 'ERR IN SUBJ' WORKREC
    GO TO P-READ.
  MOVE WORKREC TO STORE-REC OUTREC-W.
  MOVE REF-FLD-2 TO REF-FLD-G-W.
  ADD 1 TO BATCH-CT.
  MOVE BATCH-CT TO BATCH-NO-W.
  WRITE TAPEREC FROM OUTREC-W.
  MOVE SPACES TO OUTREC-W.
  GO TO P-READ.

*
P-GENERATE.
  IF RINST-CODE = SINST-CODE
    NEXT SENTENCE ELSE
    DISPLAY 'ERR IN ID' WORKREC
    GO TO P-READ.
  MOVE WORKREC TO OUTREC-W.
  MOVE SREF-FLD TO REF-FLD-G-W.
  MOVE BATCH-CT TO BATCH-NO-W.
  WRITE TAPEREC FROM OUTREC-W.
  MOVE SPACES TO OUTREC-W.
  GO TO P-READ.

*
P-CHANGE-ID.
*   IF WREC-TYPE = 6 NEXT SENTENCE
*   ELSE GO TO P-STORE-ID.
*   ADD 1 TO BATCH-CT.
*   GO TO P-STORE-ID.
*
P-END.
  CLOSE DISKETTEFL TAPEFILE.
  STOP RUN.

/*
// LBLTYP TAPE
// EXEC LNKEGT
/*
/*
*  ## EDD

```

(ii) PROGRAM RAARP81

(a) Program Description

3.6 This program produces a listing of the main data file sorted by institution batch number and record type. Form 'B' records are grouped together by booklet through the use of batch numbers which are generated by RAARP80.

3.7 Input: 1) Main data file on magnetic tape sorted by Institution, Batch number, and Record type labelled RAARDATA-STØ1 (see 2.21 through 2.34)
2) Institution dictionary file on diskette loaded to the program as a card file labelled RAARINST (see 2.36)

Records selected - All record types 01 through 13.

Output - Printout: LIST 81 entitled DATA FILE LISTING

(see Appendices II and III)

(b) Program Procedure

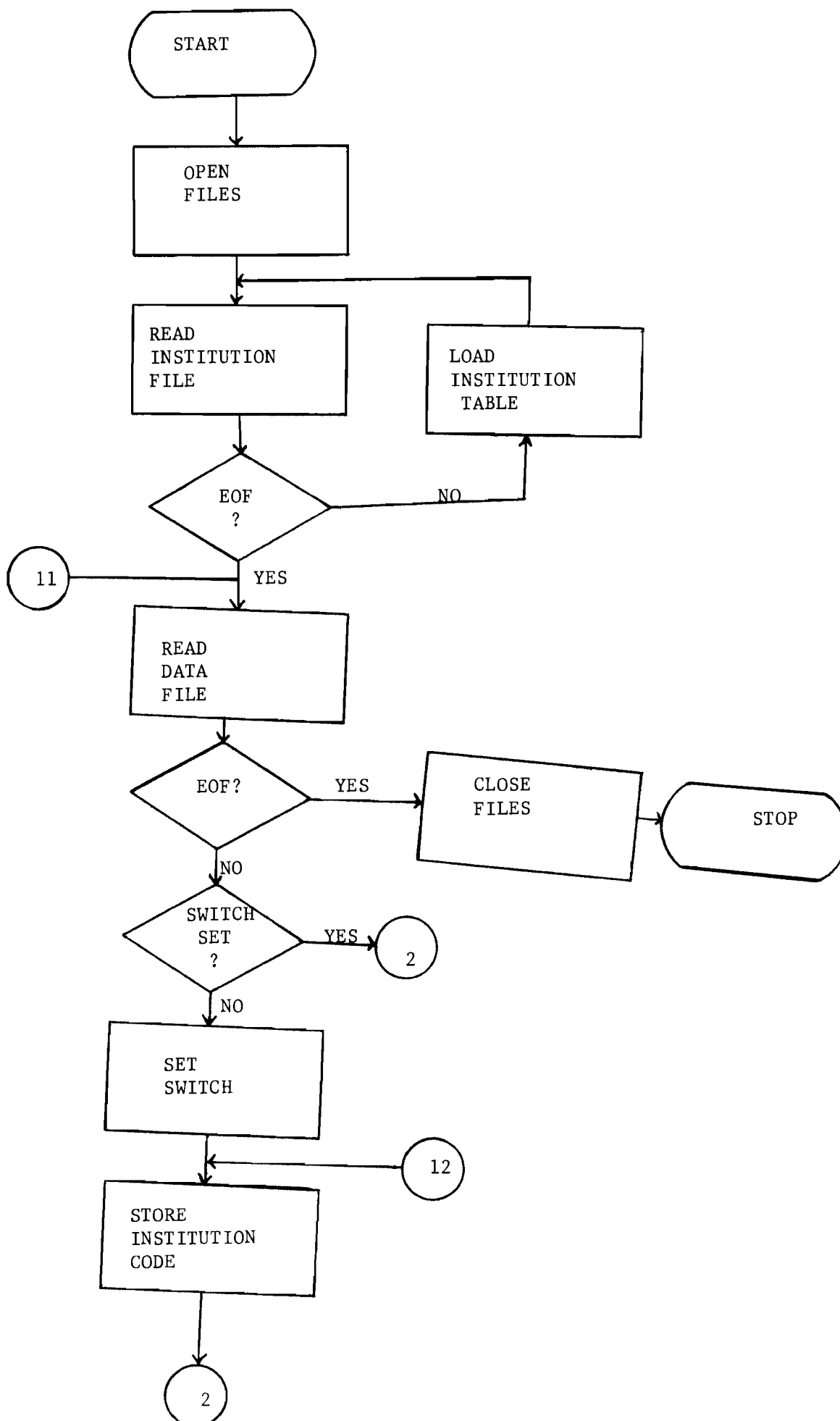
3.8 The program first loads the institution table in working storage area using data read from the input institution dictionary file - RAARINST. The modifier used is also stored in the same table for subsequent retrieval of institution name. After loading the table, the program proceeds to read the main data file - RAARDATA-STØ1.

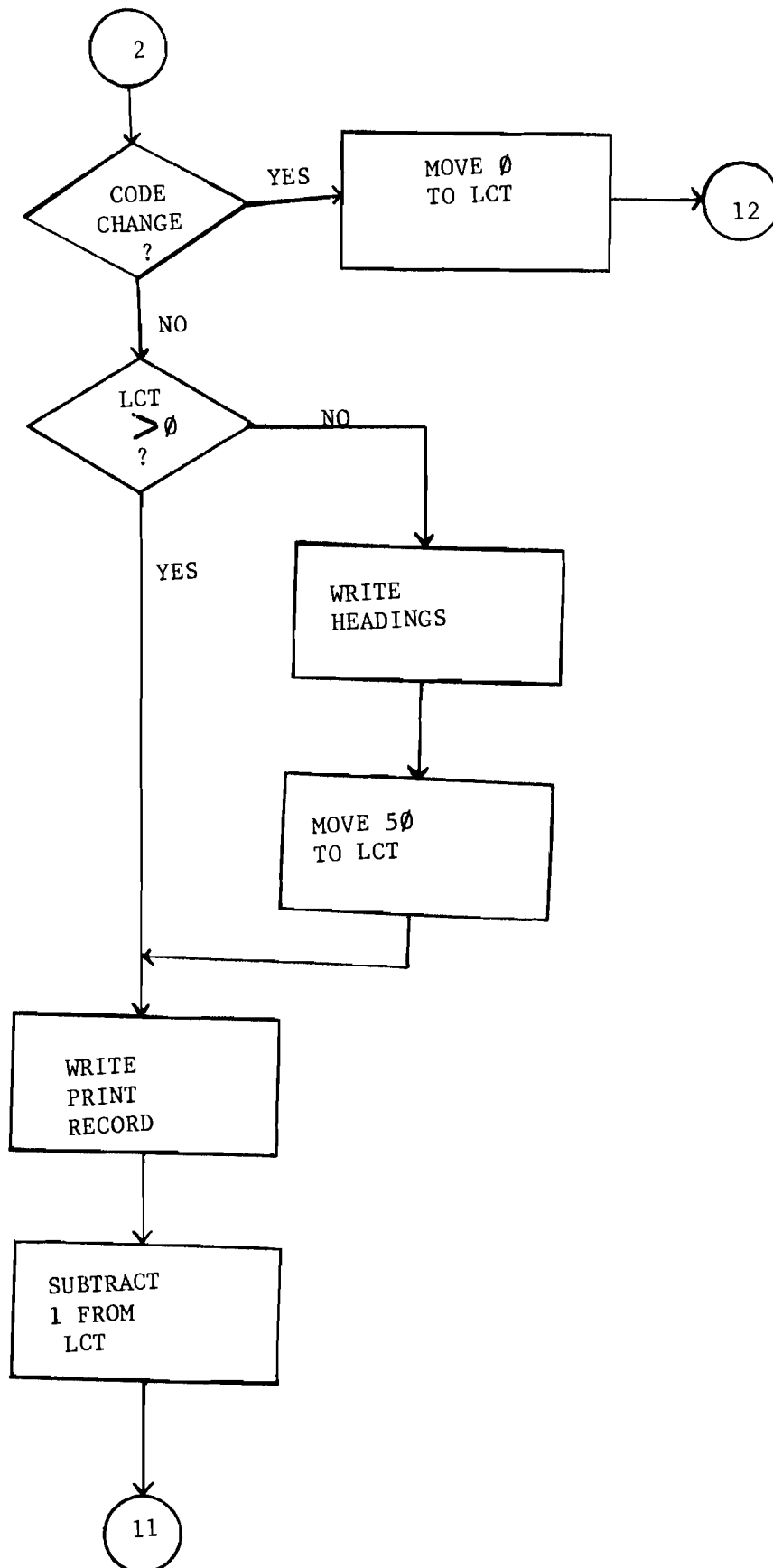
The printout is designed to display records as they appear on source 128 character diskettes. The batch numbers generated for records of every Form B are also displayed.

The institution name and code are printed in the heading and each institution starts on a new page. The relevant program flow chart and listing follow.

(c)

PROGRAM FLOWCHART - RAARP81





(d) PROGRAM LISTING - RAARP81

```
* ** JOB JNM=RAARP81,CLASS=A,USER=DPS04000
// JOB RAARP81
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP81,*
// EXEC FCDBDL,SIZE=64K
CBL NOSEQ,CLIST, SXREF, FLOW=30, STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP81.
    AUTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES. COI IS NEWPAGE
                  SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
    SELECT INST-FILE ASSIGN TO SYS025-JR-2501-S.
    SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.
  DATA DIVISION.
  FILE SECTION.
    FD DATAFILE RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS INREC.
    * VALUE OF ID IS 'RAARDATA'.
    01 INREC.
      02 FILLER PIC X(140).
    FD INST-FILE RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORDS IS INST-REC.
    * VALUE OF ID IS 'RAARINST'.
    01 INST-REC.
      02 INST-CODE PIC 9(03).
      02 FILLER PIC X.
      02 INST-NAME PIC X(63).
      02 FILLER PIC X(13).
    *
    FD PRINT-FL RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORDS IS LP-REC.
    01 LP-REC.
      02 FILLER PIC X(133).
  WORKING-STORAGE SECTION.
    77 SW1 PIC 9 VALUE 0.
    77 LCT PIC 999 VALUE 0.
    77 PAGECT PIC 999 VALUE 0.
    77 CTR1 PIC 999 VALUE 0.
    77 CTR2 PIC 999 VALUE 0.
  *
```

```

01 INST-CODE-S.
02 ID-CODE-S PIC X(03).
02 ID-NO-S REDEFINES ID-CODE-S PIC 999.
01 INST-TABLE.
02 TINST-CODE PIC X(03) OCCURS 150.
02 TINST-NM PIC X(63) OCCURS 150.
02 TMODE PIC X(03) OCCURS 999.
01 FILLER.
02 WITEM PIC X(03).
02 WITEM1 REDEFINES WITEM PIC 999.
02 WBTCHND PIC X(03).
01 WJRKREC.
02 WORKREC-A.
03 RINST-CODE PIC X(03).
03 FILLER PIC X(03).
03 RREC-TYPE PIC X(02).
03 FILLER PIC X(92).
02 FILLER PIC X(30).
02 BATCH-ND PIC X(03).
02 FILLER PIC X(07).
*
01 HEAD1.
02 FILLER PIC X(03) VALUE SPACES.
02 HDATE PIC X(08).
02 FILLER PIC X(14) VALUE SPACES.
02 FILLER PIC X(55) VALUE
'N A T I O N A L C O U N C I L F O R S C I E N C E '.
02 FILLER PIC X(30) VALUE
' A N D T E C H N O L O G Y '.
02 FILLER PIC X(11) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'PAGE:'.
02 H1PAGE PIC ZZ9.
02 FILLER PIC X(04) VALUE SPACES.
*
01 HEAD2.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(45) VALUE
'RESOURCE ALLOCATION IN AGRICULTURAL RESEACH '.
02 FILLER PIC X(43) VALUE SPACES.
*
01 HEAD3.
02 FILLER PIC X(03) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'LIST '.
02 H3REPORT PIC XX VALUE '81'.
02 FILLER PIC X(35) VALUE SPACES.
02 FILLER PIC X(50) VALUE
'D A T A F I L E L I S T I N G '.
02 FILLER PIC X(10) VALUE '(SORTED) '.
02 H3YEAR PIC X(07) VALUE SPACES.
02 FILLER PIC X(21) VALUE SPACES.
*
01 HEAD4.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(67) VALUE ALL '-'.
02 FILLER PIC X(21) VALUE SPACES.
*
01 HEAD5.
02 FILLER PIC X(45) VALUE SPACES.
02 H5HEAD PIC X(46).
02 FILLER PIC X(42) VALUE SPACES.

```

```

*
01 HEAD6.
02 FILLER      PIC X(25)  VALUE SPACES.
02 FILLER      PIC X(26)  VALUE
    'INSTITUTION CODE & NAME :-'.
02 FILLER      PIC X(02)  VALUE SPACES.
02 H6INST-CODE  PIC XXX.
02 FILLER      PIC XX    VALUE SPACES.
02 H6INST-VM    PIC X(63).
02 FILLER      PIC X(12)  VALUE SPACES.

*
01 LINE1.
02 FILLER      PIC X(11).
02 L1-DATA     PIC X(100).
02 FILLER      PIC X(22).
D 02 L1NAME     PIC X(40).

*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT DATAFILE
        INST-FILE
    OUTPUT PRINT-FL.
    MOVE CURRENT-DATE TO H1DATE.
    MOVE SPACES TO LINE1.
    MOVE 1 TO CTR2.
P-READ-1.
    READ INST-FILE AT END GO TO P-CLOSE-1.
    IF CTR2 > 150 GO TO P-TABLE-FULL.
    MOVE INST-CODE TO TINST-CODE (CTR2).
    MOVE INST-NAME TO TINST-NAME (CTR2).
    MOVE CTR2 TO TMODE (INST-CODE).
    ADD 1 TO CTR2.
    GO TO P-READ-1.

*
P-TABLE-FULL.
    DISPLAY 'INSTITUTION TABLE FULL'.
    DISPLAY 'RUN ABANPONED'.
    STOP RJN.
P-CLOSE-1.
    CLOSE INST-FILE.

*
P-READ-2.
    READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
P-R1.
    IF SW1 = 1 GO TO P-COMPARE.
    MOVE 1 TO SW1.
P-STORE-R3.
    MOVE RINST-CODE TO ID-CODE-S.
    MOVE BATCH-NO TO WBATCHNO.
    MOVE 0 TO LCT.
P-COMPARE.
    IF RINST-CODE NOT = ID-CODE-S GO TO P-STORE-R3.
    PERFORM P-HEAD THRU P-HEAD-EXIT.

*
P-PRINT.

```



```

        MOVE WORKREC-A TO LI-DATA.
        IF BATCH-NO NOT = WBATCHNO
            MOVE SPACES TO LP-REC
            WRITE LP-REC AFTER 2
            MOVE BATCH-NO TO WBATCHNO.
        WRITE LP-REC FROM LINE1 AFTER 2.
        SUBTRACT 2 FROM LCT.
        MOVE SPACES TO LINE1.
P-PRINT-EXIT.
        GO TO P-READ-2.
P-HEAD.
        IF LCT > 0 GO TO P-HEAD-EXIT.
        ADD 1 TO PAGECT.
        MOVE PAGECT TO HIPAGE.
        WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
        WRITE LP-REC FROM HEAD2 AFTER 1.
        WRITE LP-REC FROM HEAD3 AFTER 2.
        WRITE LP-REC FROM HEAD4 AFTER 1.
        MOVE ID-NO-S TO H6INST-CODE.
        IF TMODE (ID-NO-S) = SPACES
            MOVE SPACES TO H6INST-NM GO TO P-HD.
        MOVE TMODE (ID-NO-S) TO CTR2.
        MOVE TINST-VM (CTR2) TO H6INST-VM.
P-HD.
        WRITE LP-REC FROM HEAD6 AFTER 2.
        MOVE 44 TO LCT.
P-HEAD-EXIT.
        EXIT.
*
P-CLOSE-2.
        CLOSE DATAFILE
        PRINT-FL.

        STOP RUN.
/* .
// LBLTYP TAPE
// EXEC LNKEDT
/&
* $E EDJ

```

(iii) PROGRAM RAARP82

(a) Program Description

3.9 This program validates the raw input data file created by RAARP80 to produce the initial validation error list and a clean master file which will be subsequently updated by RAARP84 program.

3.10 INPUT - (1) RAARDATA on a magnetic tape (see 2.21 through 2.34)

(2) RAARPROJ-DATA on magnetic tape (see 2.38)

(3) RAARPROG-DATA on diskette (see 2.39)

OUTPUT - (1) RAARDATA on magnetic tape (see 2.21 through 2.34)

(2) Printout LIST 82 entitled 'VALIDATION ERROR LIST (RAW DATA)'. See Appendices II, III.

(b) Program Procedure

3.11 The program first opens both the input and output files, then it reads the dictionary files, RAARPROJ-DATA & RAARPROG-DATA, creating respective tables in the working storage section. At the end of loading both the project and programme tables, the program then reads the input master file, RAARDATA, validating the respective key fields in each record type. The common key fields in all the record types, are first checked for validity; the institution code and the record type are to be within the acceptable range of valid codes, whereas the survey year is checked for numeric. In each case, an appropriate error message is output to the line printer. For each record type, more than one error message can be high lighted.

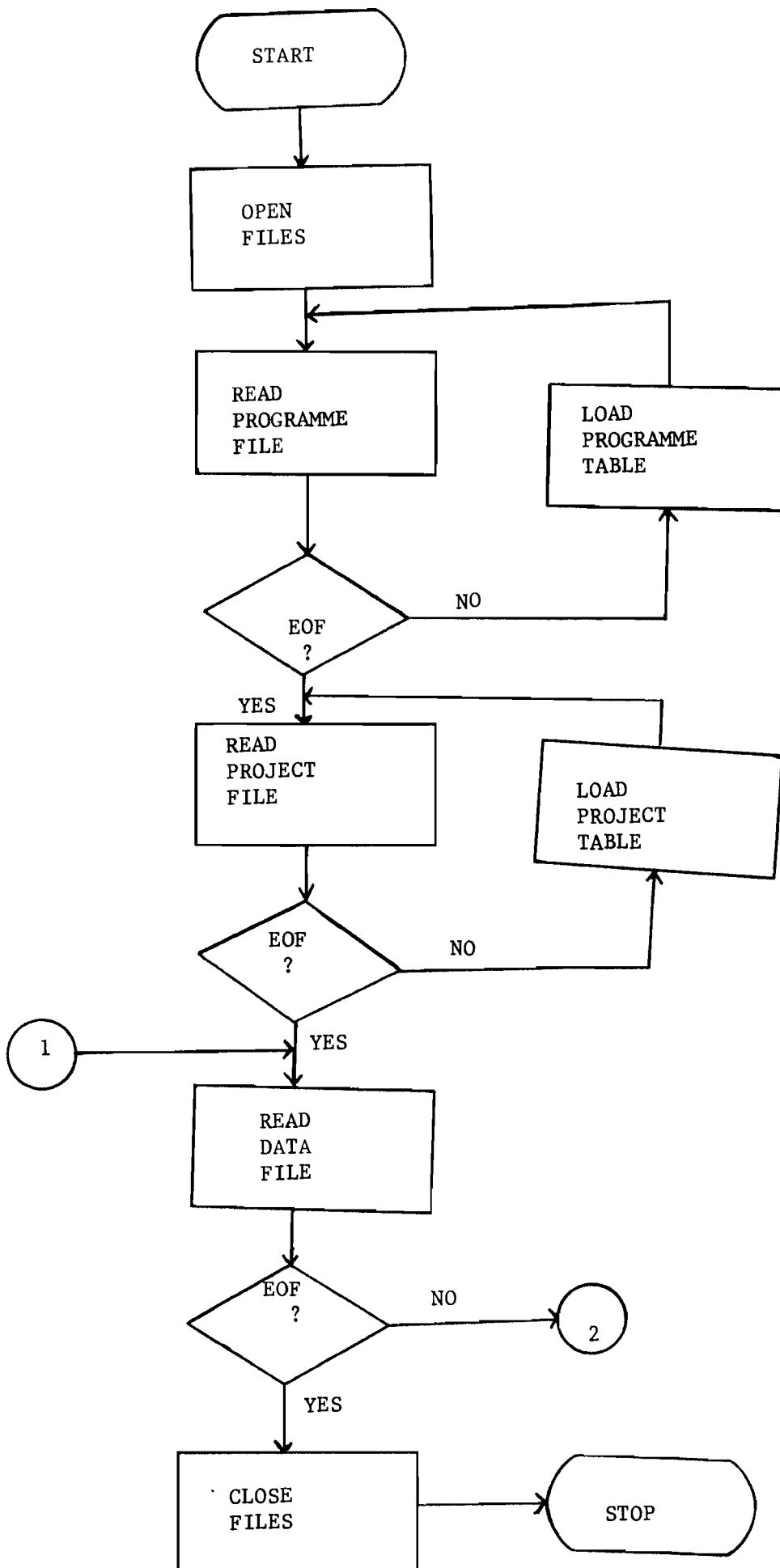
3.12 If record type is equal to 01, the director's name is checked if it is spaces. Also the qualification codes should be within the accepted range.

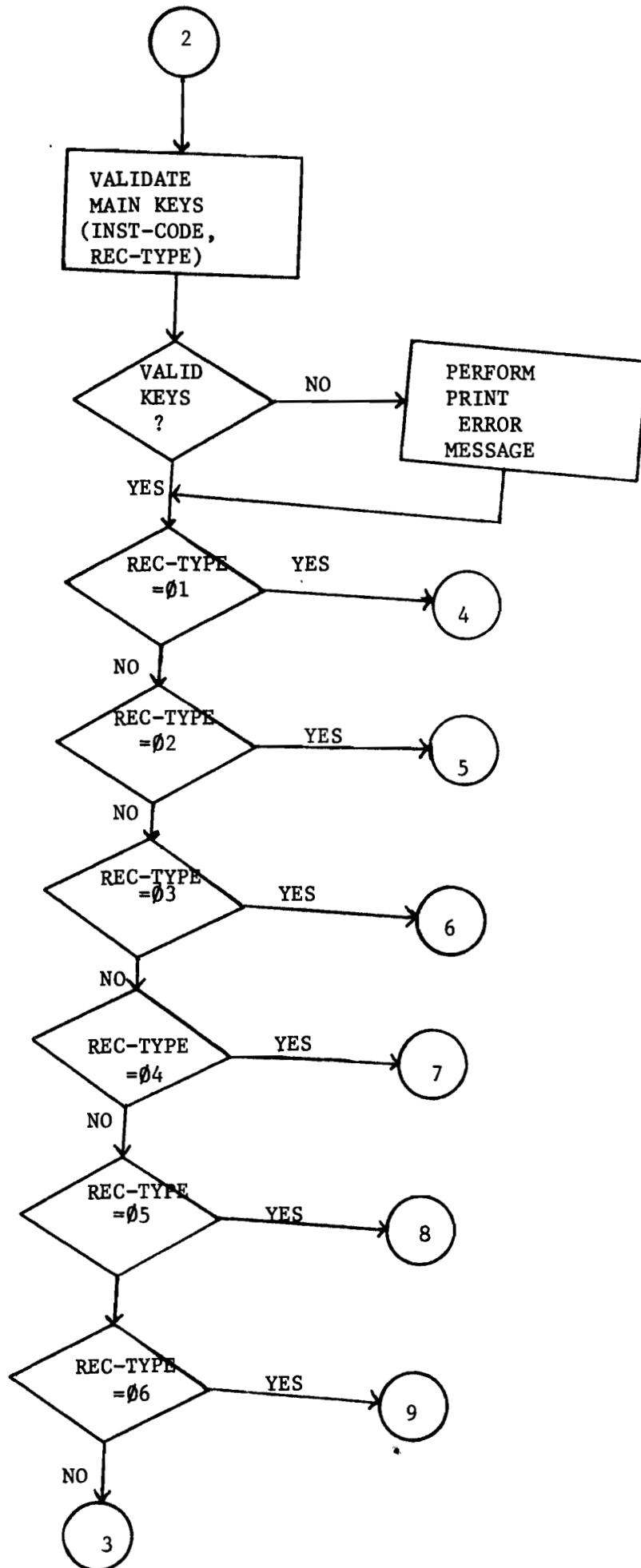
3.13 If record type equals 02, the numerical data fields are first left filled with zeroes, then checked for numeric. If any one of them is not

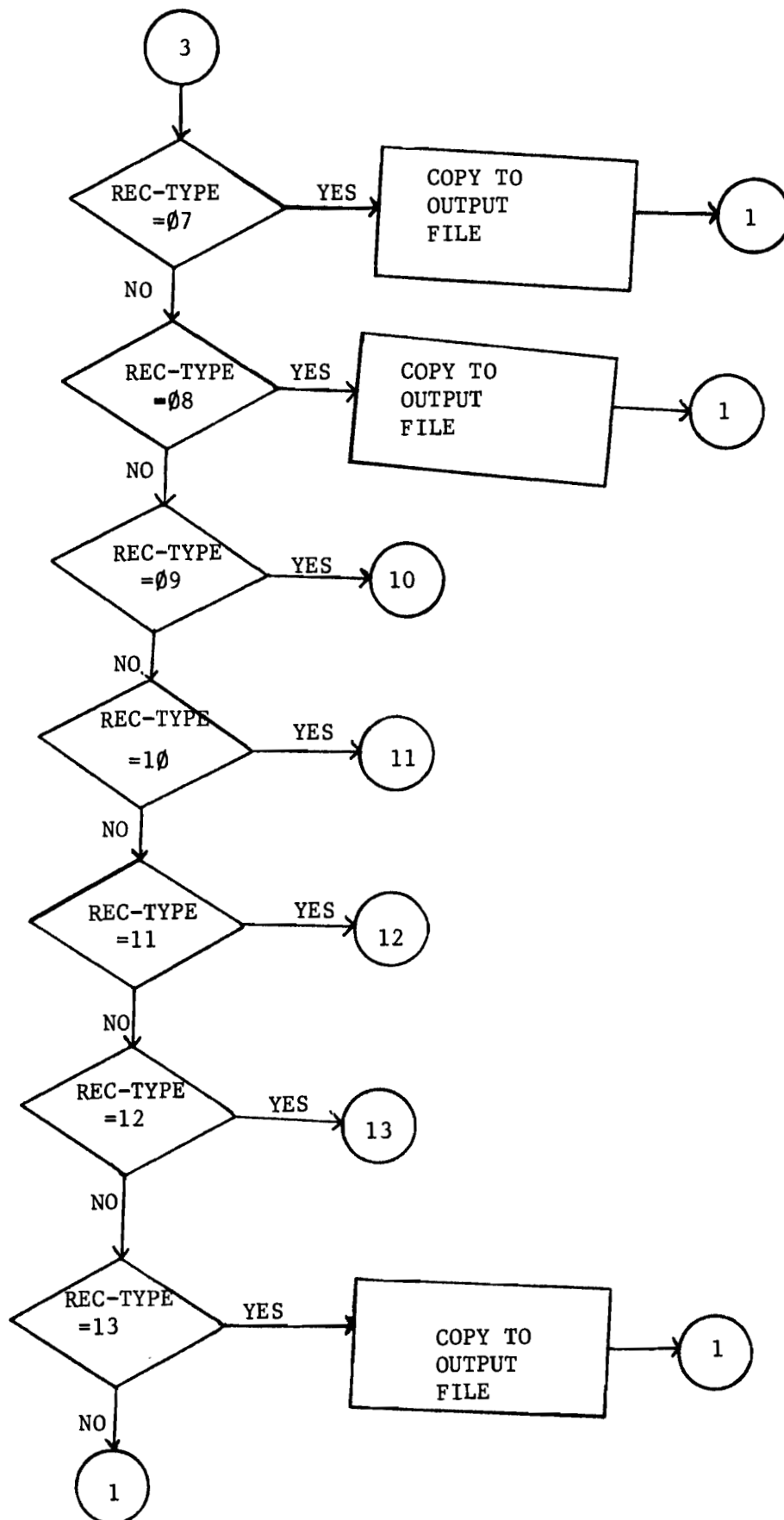
numeric then an appropriate error message is prepared and displayed on the line printer.

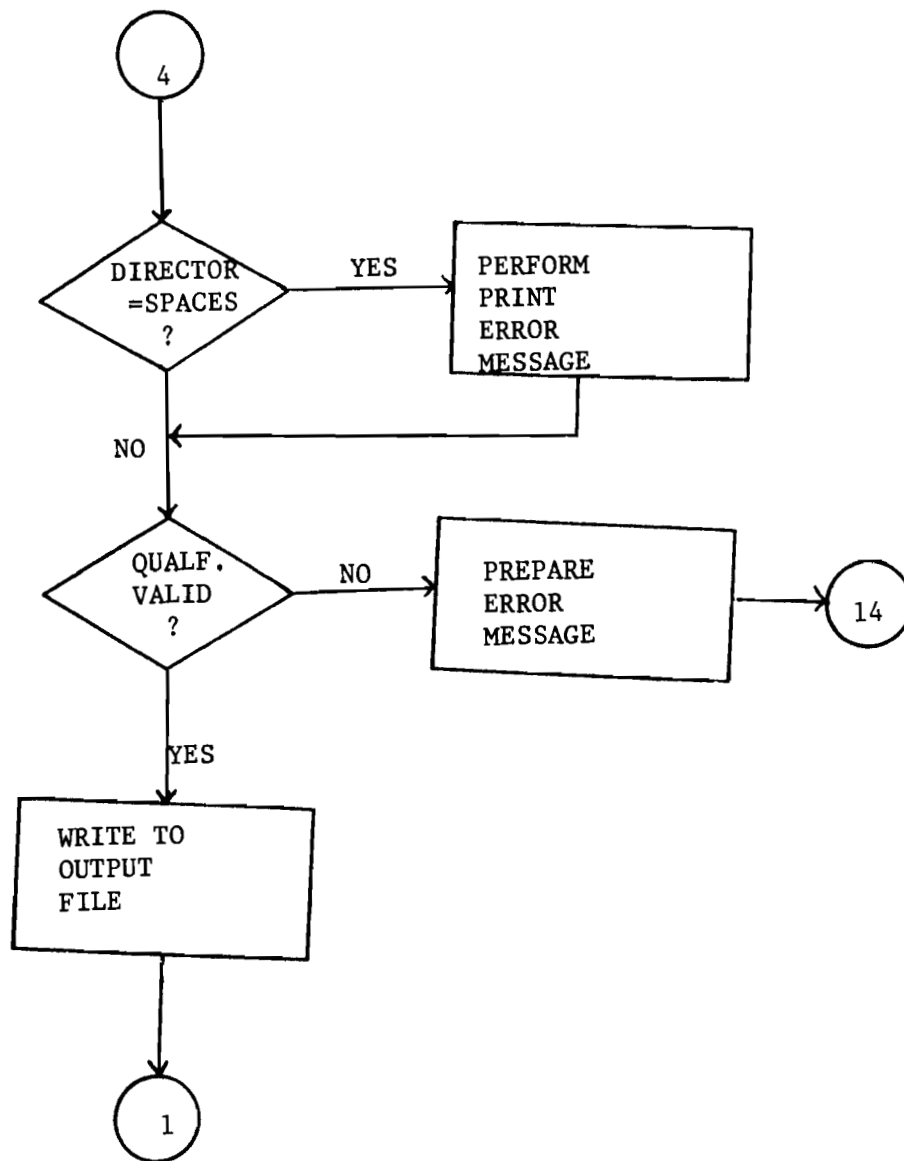
- 3.14 If record type equals 03, the item code must be either 1 or 2, otherwise an error message is printed. The expenditure amount fields are first examined replacing the leading spaces by zeroes, then checked if all are numeric.
- 3.15 If record type is equal to 04, the item code is ascertain to be within the range of the given item codes. For record type 05, the Budget year and the amount fields are similarly checked for numeric.
- 3.16 If record type equals to 06, the programme number and the project number are checked against the respective tables. If either the programme or the project number are invalid, then all the record types 06 through 12, of the same batch are rejected from the master file.
- 3.17 Record type 07 and 08 are simply copied to the output file without any further validation, provided of course the main keys are valid. If record type equals to 09, the item code must be within the range of 1 through 9. The nationality and the qualification codes should also be within the acceptable given range. Further, the percentage is checked for numeric, after examining and filling the leading spaces by zeroes.
- 3.18 If record type equals 10, 11 or 12, the numerical data fields - the number of staff, operating & personnel costs, and capital costs respectively are examined, replacing the leading spaces by zeroes. Then the program checks if all the fields are numeric.
- 3.19 If record type is 13, the record is copied to output file, if and only if the main keys are valid.

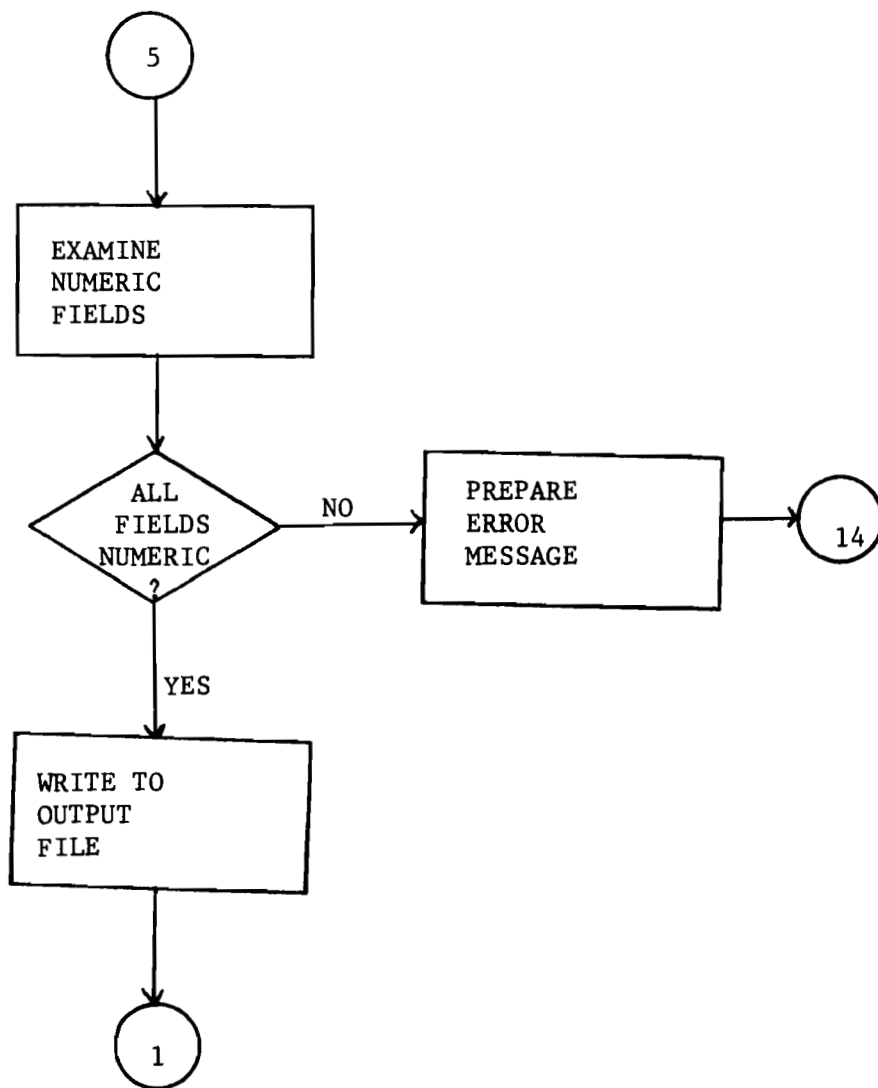
3.20 In all cases, the valid records are written to the output file. The records in error are printed with a maximum of 25 print lines, double spaced, per page together with the appropriate headings. The relevant program flowchart and listing appear in the proceeding pages.

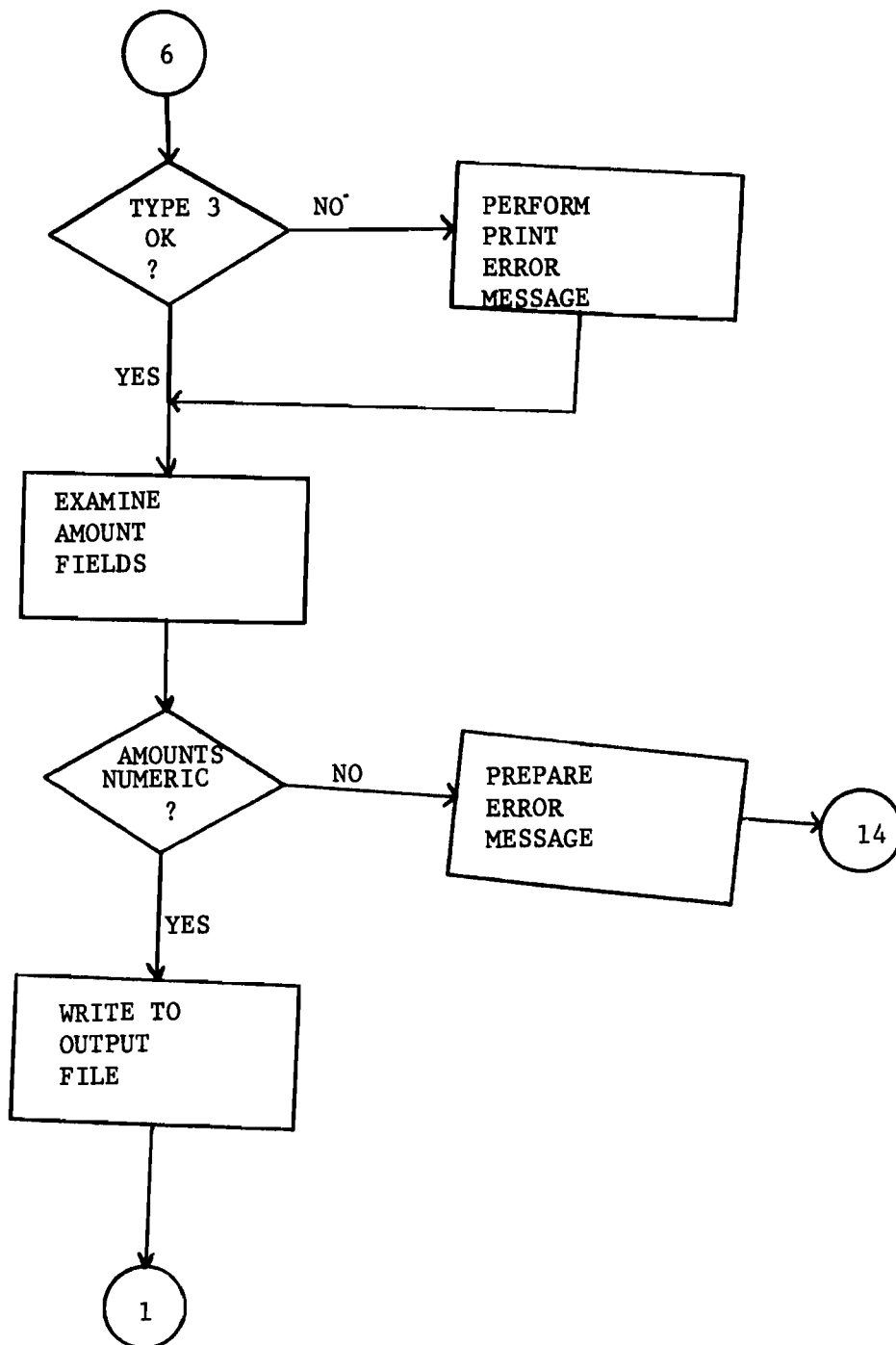


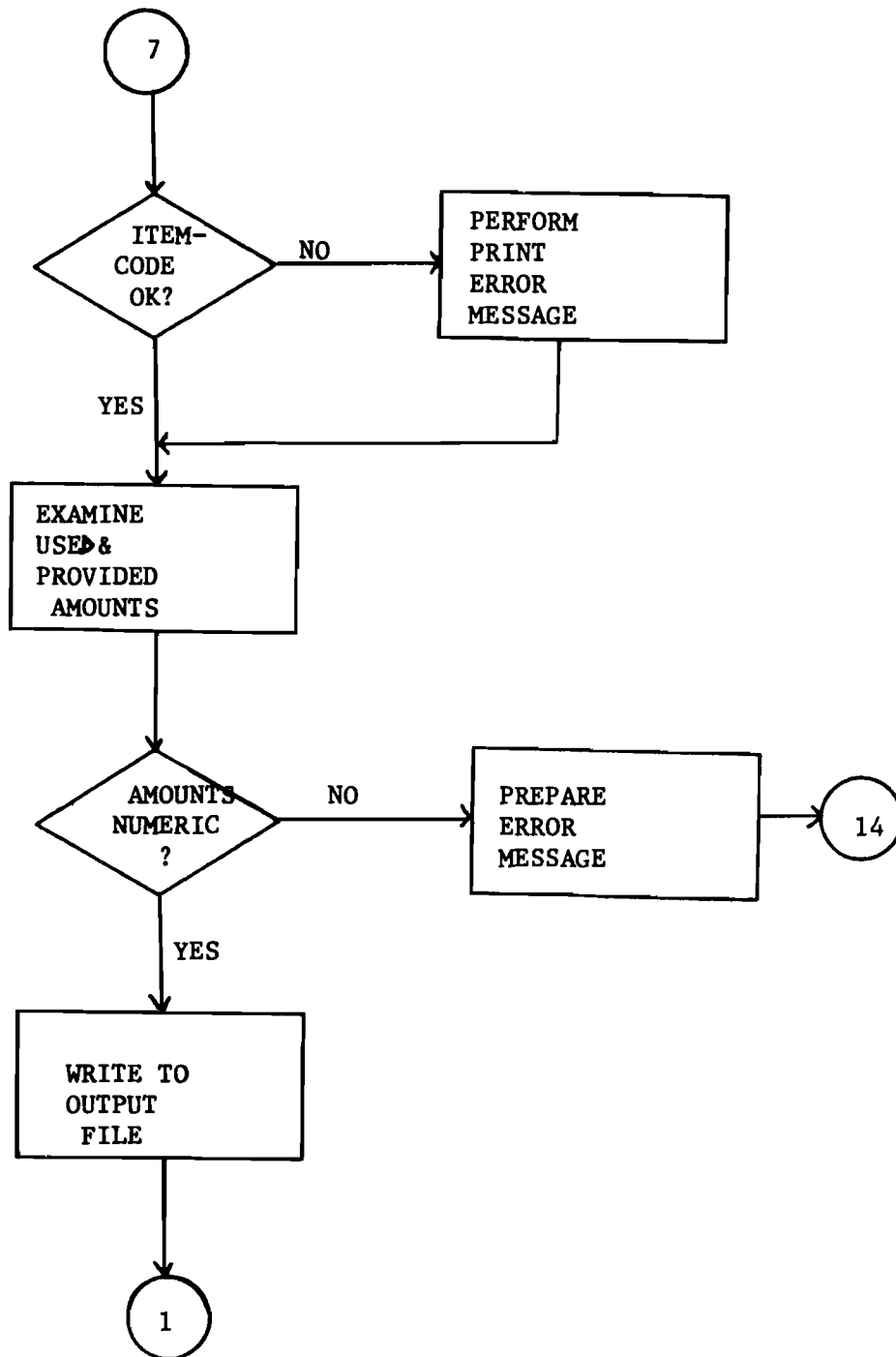


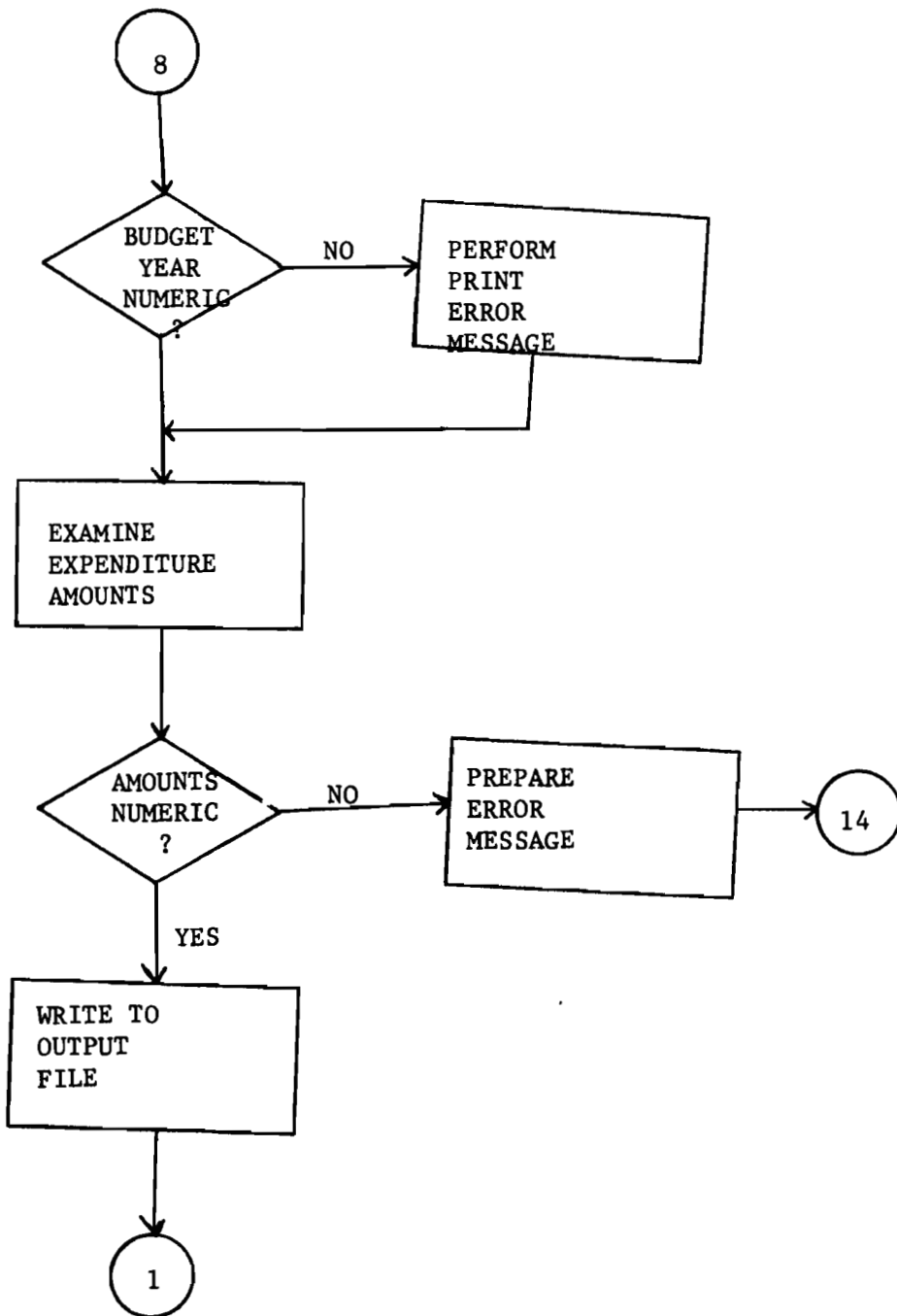


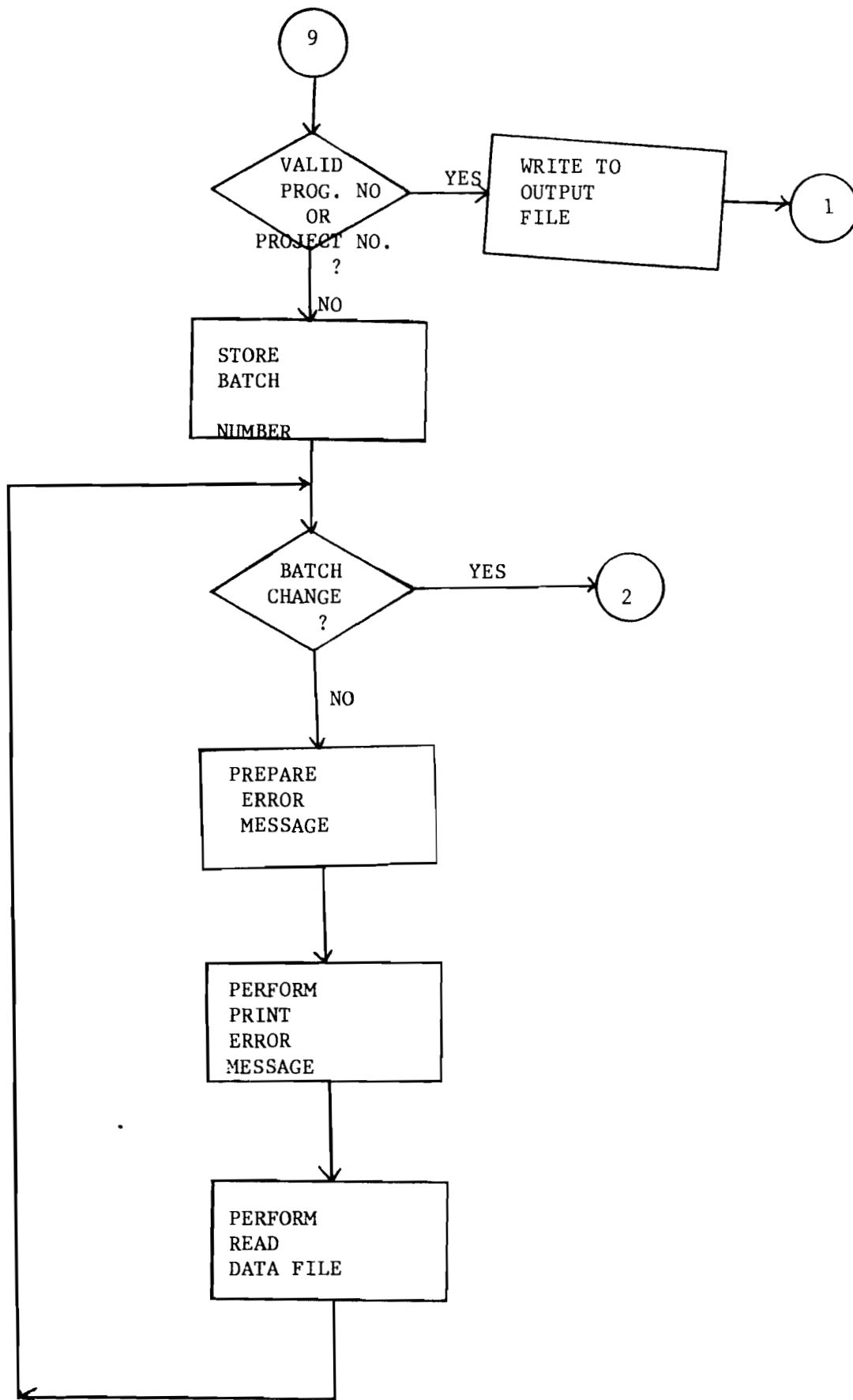


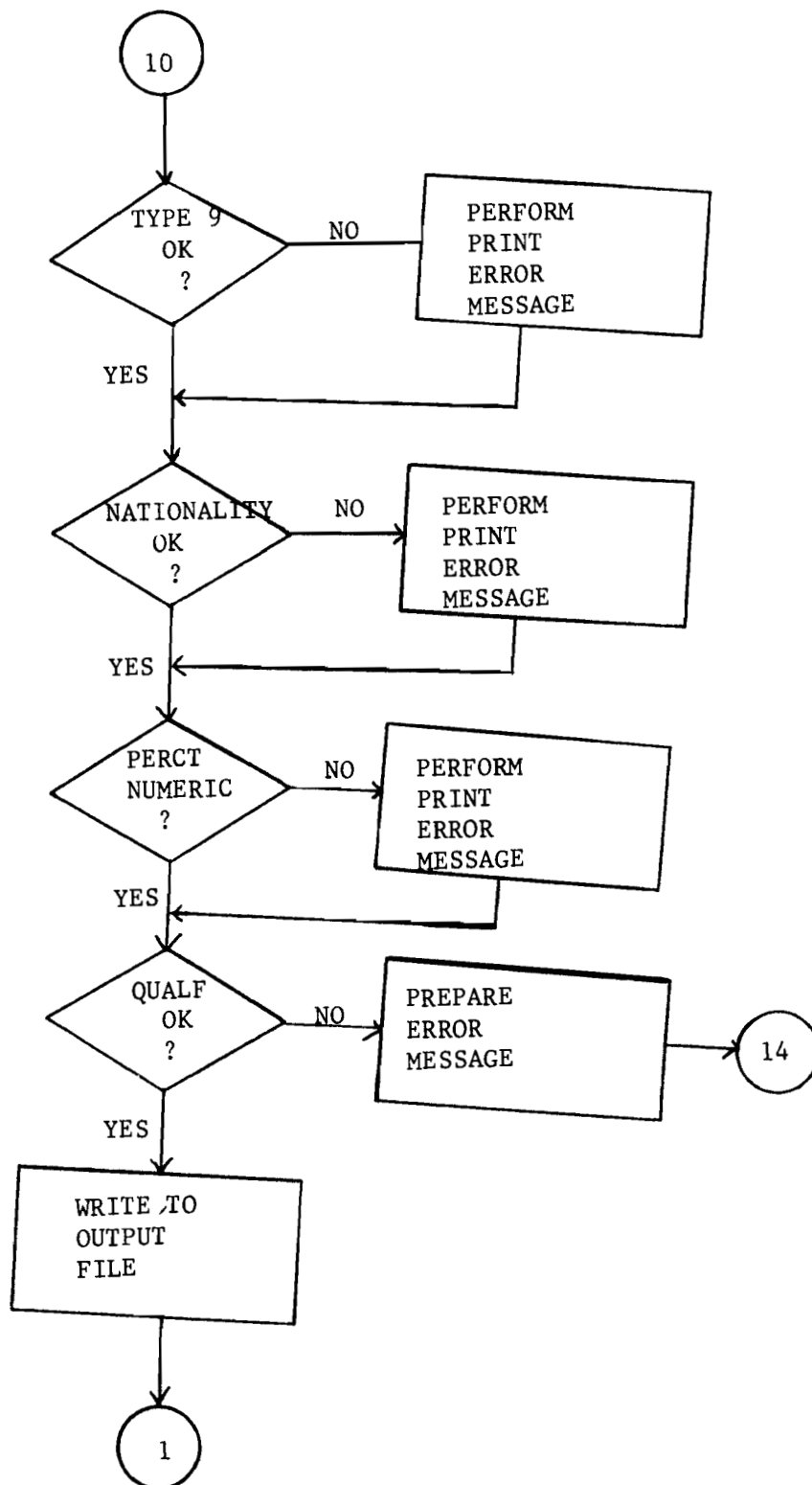


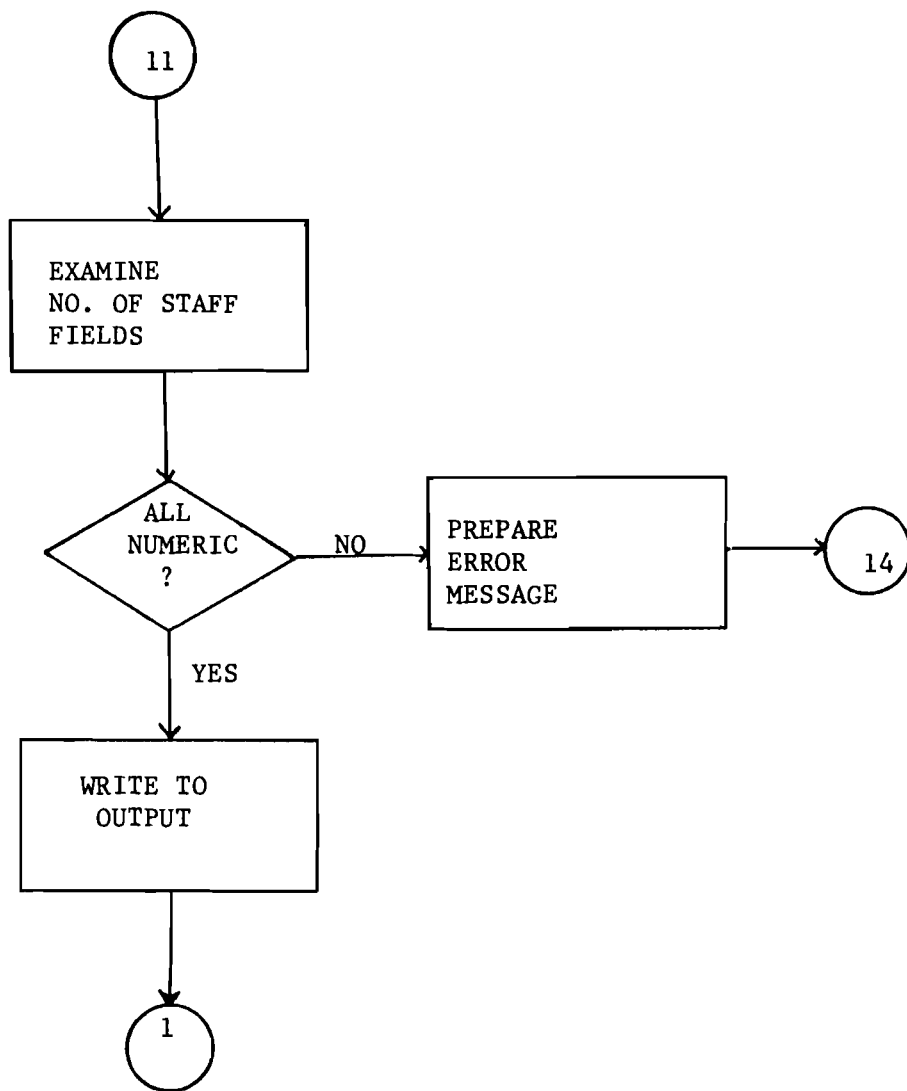


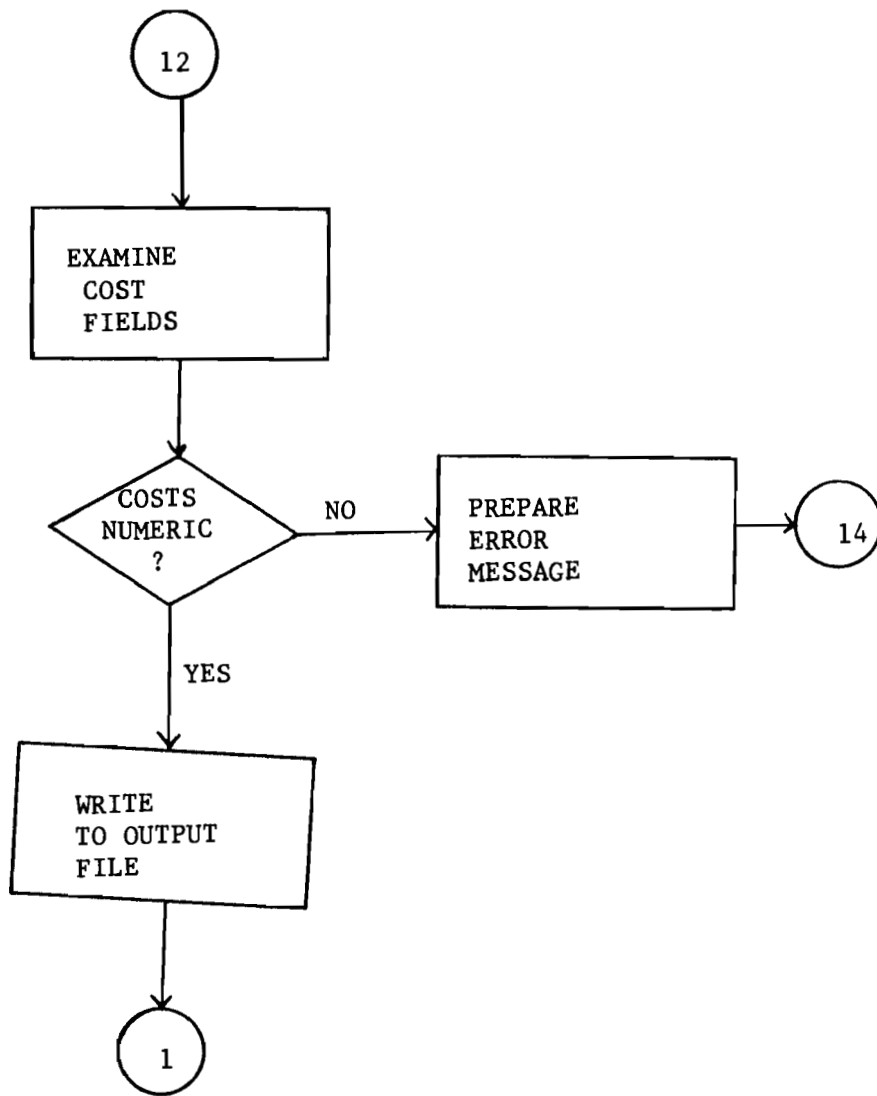


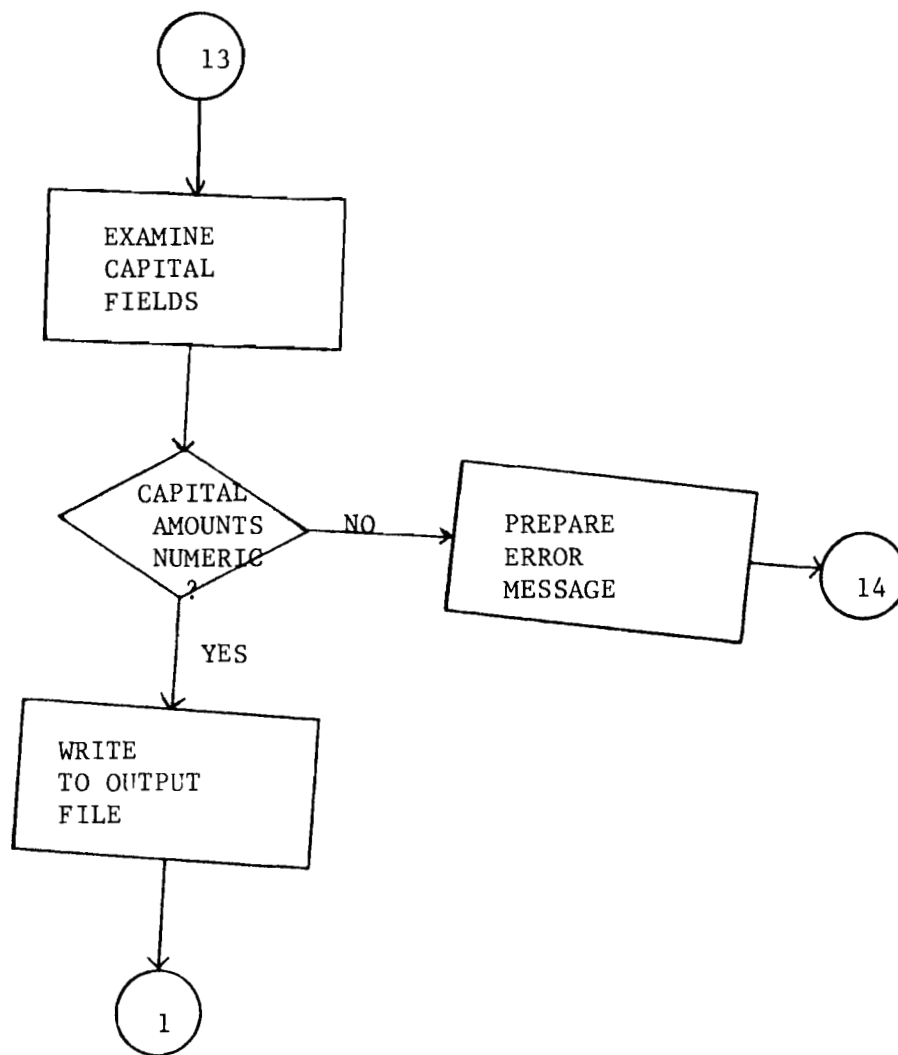


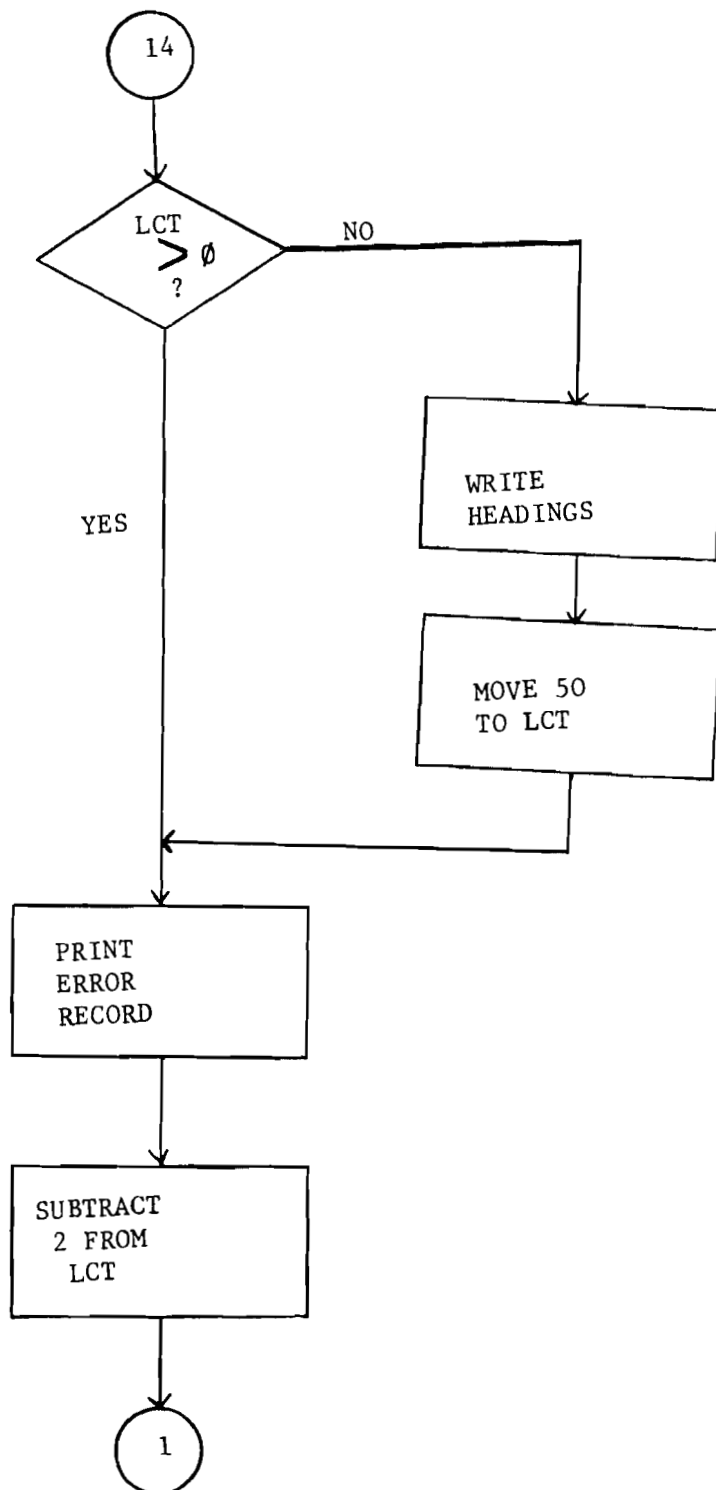












(d) PROGRAM LISTING - RAARP82

```
* ** JOB JNM=RAARP82,CLASS=A,USER=OPSO4000
// JOB RAARP82                VALIDATION PRJGRAM
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP82,*
// EXEC FCOBJL,SIZE=644
CBL NOSEQ,CLIST,SKREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
.   PROGRAM-ID. RAARP82.
    AUTHOR.   CKC,   AWK,   AMK,   NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES.  CO1 IS NEWPAGE SYSIPT IS CREADER.
    INPUT-OUTPUT SECTION.
    FILE-CONTROL.
      SELECT PRINT-FL    ASSIGN TO  SYS027-UR-1403-S.
      SELECT TAPEFILE    ASSIGN  TO  SYS001-JT-3420-S.
      SELECT TAPEOUT     ASSIGN  TO  SYS002-UT-3420-S.
      SELECT PROJ-FL     ASSIGN  TO  SYS003-UT-3420-S.
      SELECT PRG-FILE    ASSIGN  TO  SYS025-UR-2501-S.

    DATA DIVISION.
    FILE SECTION.
    FD  PRINT-FL    RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORD IS LP-REC.
    01  LP-REC.
      02  FILLER          PIC X(133).

*
    FD  TAPEFILE    RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS TAPEREC.
*
    01  TAPEREC.
      02  FILLER          PIC X(140).
    FD  PROJ-FL    RECORDING MODE IS F
      BLOCK CONTAINS 8000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS PROJ-REC.
*
    01  PROJ-REC.
      02  PROJ-NO-1      PIC 9(15).
      02  FILLER          PIC X.
      02  PROJ-NAME-1    PIC X(64).

*
    FD  PRG-FILE    RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORD IS PRG-REC.
*
    01  PRG-REC.
      02  PRG-NO-1      PIC 9(15).
      02  FILLER          PIC X.
      02  PRG-NAME-1    PIC X(64).

*
    FD  TAPEOUT     RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS OUTREC.
*
    01  OUTREC.
      02  FILLER          PIC X(140).
    WORKING-STORAGE SECTION.
    77  CTR          PIC 999 VALUE 0.
```

```

77 PAGE-CT          PIC 999 VALUE 0.
77 LCT             PIC 999 VALUE 0.
77 SW1             PIC 9  VALUE 0.
77 GEN-IND-1       PIC 9 VALUE 0.
77 GEN-IND-2       PIC 9 VALUE 0.
77 CTR1            PIC 99 VALUE 0.
77 CTR2            PIC 99 VALUE 0.
01 STORE-1.
  02 QUAL-W        PIC XX.
    88 QUALF-OK    VALUE '01' THRU '09'.
01 WID-NO.
  02 INST-CODE     PIC X(03).
  02 SURV-YEAR     PIC XX.
  02 WREC-TYPE     PIC 99.
  02 WBTCH-NO      PIC X(03).
01 WORKREC-01.
  02 WINST-CODE    PIC X(03).
    88 INST-JK     VALUE '001' THRU '005' '010' THRU '017'
                      '020' THRU '025' '030' THRU '052'
                      '055' '061' THRU '083' '099' THRU '101'
                      '200' THRU '210' '300' THRU '306'
                      '400' THRU '402'.
  02 WSURV-YR      PIC XX.
  02 FILLER        PIC X.
  02 REC-TYPE      PIC XX.
    88 REC-TYPE-OK VALUE '01' THRU '13'.
  02 WDIRECTOR-NM  PIC X(15).
  02 WQUAL.
    03 QUAL-1      PIC XX OCCURS 5.
  02 FILLER        PIC X(107).
01 WORKREC-02 REDEFINES WORKREC-01.
  02 FILLER        PIC X(08).
  02 WYEARS.
    03 WPHDYEAR    OCCURS 10.
    04 WPHD-1      PIC XX.
    03 WMSCYEARS   OCCURS 10.
    04 WMSC-1      PIC XX.
    03 WBSCYEARS   OCCURS 10.
    04 WBSC-1      PIC XX.
  02 FILLER4.
    03 WSEN-TECH   PIC XX.
    03 WTECH       PIC XX.
    03 WTECHN      PIC XX.
    03 WEXEC       PIC XX.
    03 WCLER       PIC XX.
    03 WARTSAN     PIC XX.
    03 WUNSKIL     PIC XXX.
  02 FILLER        PIC X(57).
01 WORKREC-03 REDEFINES WORKREC-01.
  02 FILLER        PIC X(08).
  02 TYPE32        PIC X.
    88 TYPE-OK     VALUE '1' '2'.
  02 REC-DEV-AMT.
    03 AMT-1       PIC X(07) OCCURS 10.
  02 FILLER        PIC X(61).
01 WORKREC-04 REDEFINES WORKREC-01.
  02 FILLER        PIC X(08).
  02 RITEM-CODE    PIC X(03).
    88 CODE-JK     VALUE '000' '050' '100' '110' '120' '140'
                      '150' '151' '153' '154' '160' '172'
                      '173' '174' '180' '190' '200' '210'
                      '220' '222' '250' '302' '340'.
  02 FILLER        PIC X(109).
  02 REXP.
    03 RPROVIDED   PIC X(07).
    03 RUSED       PIC X(07).

```

```

02 FILLER PIC X(106).
01 WORKREC-05 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 BUDG-YR1 PIC XX.
02 EXP-1 PIC X(07).
02 EXPED11 REDEFINES EXP-1 PIC 9(07).
02 BUDG-YR2 PIC XX.
02 EXP-2 PIC X(07).
02 EXPED22 REDEFINES EXP-2 PIC 9(07).
02 FILLER PIC X(114).
01 WORKREC-06 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 PROGRAMME-NO.
03 RREF-NO-1 PIC XXX.
03 RCAT-1 PIC X.
03 RSUBJ-1 PIC XXX.
03 RFFDR-1 PIC XX.
03 RYEAR-1 PIC XX.
03 RSERIAL-1 PIC X(04).
02 PROJECT-NO.
03 RREF-NO-2 PIC X(03).
03 RCAT-2 PIC X.
03 RSUBJ-2 PIC XXX.
03 RFFDR-2 PIC XX.
03 RYEAR-2 PIC XX.
03 RSERIAL-2 PIC X(04).
02 FILLER PIC X(90).
*
01 WORKREC-09 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 REC-TYPE92 PIC X.
88 TYPE9-DK VALUE '1' THRU '9'.
02 FILLER PIC X(17).
02 QUALF PIC XX OCCURS 5.
02 RES-EXP PIC XX.
02 NATIONALITY PIC XX.
88 <-JK VALUE '01' '02'.
02 PERCT-1 PIC X(03).
02 FILLER PIC X(57).
02 PROG-NO PIC X(15).
02 PROJ-NO PIC X(15).
02 BATCH-NO PIC X(03).
02 FILLER PIC X(07).
01 WORKREC-10 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 STAFF-1 PIC XX.
02 FILLER PIC X(08).
02 STAFF-2 PIC XX.
02 FILLER PIC X(08).
02 STAFF-3 PIC XX.
02 FILLER PIC X(08).
02 STAFF-4 PIC XX.
02 FILLER PIC X(100).
*
01 WORKREC-11 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 RECURRENT-1.
03 PERS-LOCAL PIC X(07).
03 PERS-AID PIC X(07).
03 OPER-LOCAL PIC X(07).
03 OPER-AID PIC X(07).
02 FILLER PIC X(104).
01 WORKREC-12 REDEFINES WORKREC-01.
02 FILLER PIC X(18).
02 CAPITAL-COST.
03 CAPITAL-1 PIC X(07).

```

```

03 FILLER PIC X(10).
03 CAPITAL-2 PIC X(07).
03 FILLER PIC X(10).
03 CAPITAL-3 PIC X(07).
03 FILLER PIC X(10).
03 CAPITAL-4 PIC X(07).
03 FILLER PIC X(10).
03 CAPITAL-5 PIC X(07).
02 FILLER PIC X.
02 RDATE-1 PIC XX.
02 RDATE-2 PIC XX.
02 FILLER PIC X(42).
01 WJR<REC-13 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 DESIG-INT PIC X.
02 QUIZES PIC X(63).
02 FILLER PIC X(63).
*
01 PROJ-TABLE.
02 WTPROJ-NO PIC X(15) OCCURS 500.
02 WTPROJ-NAME PIC X(64) OCCURS 500.
01 PROG-TABLE.
02 WTPROG-NO PIC X(15) OCCURS 500.
02 WTPROG-NAME PIC X(64) OCCURS 500.
01 LINE1.
02 FILLER PIC X(13).
02 LI-INST-CODE PIC XXX.
02 FILLER PIC X(11).
02 LI-SURV-YR PIC XX.
02 FILLER PIC X(15).
02 LI-REC-TYPE PIC XX.
02 LI-ITEM-CODE PIC X(03).
02 FILLER PIC X(11).
02 LI-PROG PIC X(15).
02 FILLER PIC X(04).
02 LI-PROJ PIC X(15).
02 FILLER PIC X(04).
02 LI-ERROR PIC X(35).
01 HEAD1.
02 FILLER PIC X(03) VALUE SPACES.
02 HDATE PIC X(08) VALUE SPACES.
02 FILLER PIC X(14) VALUE SPACES.
02 FILLER PIC X(55) VALUE
'N A T I O N A L C O U N C I L F O R S C I E N C E'.
02 FILLER PIC X(30) VALUE
' A N D T E C H N O L O G Y '.
02 FILLER PIC X(11) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'PAGE:'.
02 H1PAGE PIC ZZ9.
02 FILLER PIC X(04) VALUE SPACES.
01 HEAD2.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(45) VALUE
'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER PIC X(43) VALUE SPACES.
01 HEAD3.
02 FILLER PIC X(10) VALUE SPACES.
02 FILLER PIC X(12) VALUE 'L I S T 82'.
02 FILLER PIC X(33) VALUE SPACES.
02 FILLER PIC X(32) VALUE
'VALIDATION ERROR LIST-(RAW DATA)'.
02 FILLER PIC X(46) VALUE SPACES.
01 HEAD4.
02 FILLER PIC X(55) VALUE SPACES.
02 FILLER PIC X(32) VALUE ALL '-'.
02 FILLER PIC X(46) VALUE SPACES.

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01 HEAD5.
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(10) VALUE 'INST. CODE'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(10) VALUE 'SURV. YEAR'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(18) VALUE 'REC-TYPE/ITEM CODE'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(16) VALUE 'PRJGRAMME NUMBER'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(15) VALUE 'PROJECT  NJMBER'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(25) VALUE
    'E R R O R      M E S S A G E'.
02 FILLER      PIC X(09) VALUE SPACES.
01 HEAD6.
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(10) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(10) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(18) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(16) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(15) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(25) VALUE ALL '-'.
02 FILLER      PIC X(09) VALUE SPACES.
PROCEDURE DIVISION.
P-START.
    OPEN INPUT TAPEFILE PROG-FILE PROJ-FL
           OUTPUT PRINT-FL TAPEOUT.
    MOVE CURRENT-DATE TO HDATE.
    MOVE SPACES TO LINE1.
    MOVE 1 TO CTR.
P-READ-PROJ.
    READ PROJ-FL AT END MOVE 1 TO CTR GO TO P-READ-PROG.
    IF CTR > 500 GO TO P-PROJ-T-FULL.
    MOVE PROJ-NJ-1 TO WTPROJ-NO (CTR).
    MOVE PROJ-NAME-1 TO WTPROJ-NAME (CTR).
    ADD 1 TO CTR.
    GO TO P-READ-PROJ.
P-PROJ-T-FULL.
    DISPLAY 'PROJECT TABLE FULL' CTR.
    STOP 'RUN ABANDONED'.
    STOP RUN.
P-READ-PROG.
    READ PROG-FILE AT END GO TO P-READ.
    IF CTR > 500 GO TO P-PROG-T-FULL.
    MOVE PROG-NJ-1 TO WTPROG-NO (CTR).
    MOVE PROG-NAME-1 TO WTPROG-NAME (CTR).
    ADD 1 TO CTR.
    GO TO P-READ-PROG.
P-PROG-T-FULL.
    DISPLAY 'PROGRAMME TABLE FULL'.
    STOP 'RUN ABANDONED'.
    STOP RUN.
P-READ.
    MOVE SPACES TO WORKREC-01.
    READ TAPEFILE INTO WORKREC-01 AT END GO TO P-END.
P-MAIN-KEYS.
    IF NOT INST-OK MOVE 'INST. CODE ERROR' TO L1-ERROR
                      PERFORM P-ERROR THRU P-ERROR-EXIT.
    IF NOT REC-TYPE-OK MOVE 'REC TYPE ERROR' TO L1-ERROR
                      PERFORM P-ERROR THRU P-ERROR-EXIT.

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IF W$SRV-YR NOT NUMERIC MOVE 'SURVEY YEAR ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.

P-SELECT.
IF REC-TYPE = '07' OR
REC-TYPE = '08' OR
REC-TYPE = '13' GO TO P-WRITE-OUT.
IF REC-TYPE = '01' GO TO P-REC-01.
IF REC-TYPE = '02' GO TO P-REC-02.
IF REC-TYPE = '03' GO TO P-REC-03.
IF REC-TYPE = '04' GO TO P-REC-04.
IF REC-TYPE = '05' GO TO P-REC-05.
IF REC-TYPE = '06' GO TO P-REC-06.
IF REC-TYPE = '09' GO TO P-REC-09.
IF REC-TYPE = '10' GO TO P-REC-10.
IF REC-TYPE = '11' GO TO P-REC-11.
IF REC-TYPE = '12' GO TO P-REC-12.
GO TO P-READ.

P-REC-01.
IF W$DIRECTOR-NM = SPACES
MOVE 'DIRECTOR NAME ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.

MOVE 1 TO CTRL.
P-QJAL-LOOP.
IF CTRL > 5 GO TO P-WRITE-OUT.
IF QUAL-1 (CTRL) = SPACES ADD 1 TO CTRL GO TO P-QJAL-LOOP.
EXAMINE QUAL-1 (CTRL) REPLACING LEADING SPACES BY ZEROS.
MOVE QUAL-1 (CTRL) TO QUAL-W.
IF NOT QUALF-OK MOVE 'QUALIFICATION ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.

ADD 1 TO CTRL.
GO TO P-QJAL-LOOP.

P-REC-02.
EXAMINE W$EN-TECH REPLACING LEADING SPACES BY ZEROS.
EXAMINE W$TECH REPLACING LEADING SPACES BY ZEROS.
EXAMINE W$TECHN REPLACING LEADING SPACES BY ZEROS.
EXAMINE W$EXEC REPLACING LEADING SPACES BY ZEROS.
EXAMINE W$CLER REPLACING LEADING SPACES BY ZEROS.
EXAMINE W$ARTSAN REPLACING LEADING SPACES BY ZEROS.
EXAMINE W$UNSKIL REPLACING LEADING SPACES BY ZEROS.
IF W$EN-TECH NOT NUMERIC OR
W$TECH NOT NUMERIC OR
W$TECHN NOT NUMERIC OR
W$EXEC NOT NUMERIC OR
W$CLER NOT NUMERIC OR
W$ARTSAN NOT NUMERIC OR
W$UNSKIL NOT NUMERIC
MOVE 'NO. OF STAFF ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.

GO TO P-WRITE-OUT.

P-REC-03.
IF NOT TYPE-OK MOVE 'TYPE ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.

MOVE 1 TO CTRL.
P-AMT-LOOP.
IF CTRL > 10 GO TO P-WRITE-OUT.
EXAMINE AMT-1 (CTRL) REPLACING LEADING SPACES BY ZEROS.
IF AMT-1 (CTRL) NOT NUMERIC MOVE 'AMOUNT ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.

ADD 1 TO CTRL.
GO TO P-AMT-LOOP.

P-REC-04.
IF NOT CODE-OK MOVE 'ITEM CODE ERROR' TO L1-ERROR
PERFORM P-ERROR THRU P-ERROR-EXIT.
EXAMINE R$PROVIDED REPLACING LEADING SPACES BY ZEROS.
EXAMINE R$USED REPLACING LEADING SPACES BY ZEROS.
IF R$PROVIDED NOT NUMERIC OR

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        RUSED      NOT NUMERIC
        MOVE 'PROVIDED OR USED AMT ERROR' TO LI-ERROR
        PERFORM P-ERROR THRU P-ERROR-EXIT.
    GJ TO P-WRITE-OUT.
P-REC-05.
    IF BUDG-YR1 = SPACES OR
       BUDG-YR2 = SPACES OR
       BUDG-YR1 NOT NUMERIC OR
       BUDG-YR2 NOT NUMERIC MOVE 'BUDGET YEAR ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
P-CHECK-AMT.
    EXAMINE EXP-1 REPLACING LEADING SPACES BY ZEROS.
    EXAMINE EXP-2 REPLACING LEADING SPACES BY ZEROS.
    IF EXP-1 NOT NUMERIC OR
       EXP-2 NOT NUMERIC MOVE 'EXP. AMOUNT ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    GJ TO P-WRITE-OUT.
P-REC-06.
    PERFORM P-SEARCH-PRJNO THRU P-PRJG-EXIT.
    IF GEN-IND-1 = 0 MOVE 'PROG. NUMBER ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    PERFORM P-SEARCH-PROJNO THRU P-PROJ-EXIT.
    IF GEN-IND-2 = 0 MOVE 'PROJ. NUMBER ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    IF GEN-IND-1 = 0 OR
       GEN-IND-2 = 0 PERFORM P-DEL-REST-TYPES THRU P-REST-EXIT
    GO TO P-MAIN-KEYS.
    MOVE 0 TO GEN-IND-1 GEN-IND-2.
    GJ TO P-WRITE-OUT.
P-REC-09.
    IF NOT TYPE9-OK MOVE 'REC-TYPE92 ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    IF NATIONALITY = SPACES GJ TO P-PERCT.
    EXAMINE NATIONALITY REPLACING LEADING SPACES BY ZEROS.
    IF NOT <-OK MOVE 'NATIONALITY ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
P-PERCT.
    EXAMINE PERCT-1 REPLACING LEADING SPACES BY ZEROS.
    IF PERCT-1 NOT NUMERIC MOVE 'PERCENTAGE ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    MOVE 1 TO CTRL.
P-REC9-LOOP.
    IF CTRL > 5 GJ TO P-WRITE-OUT.
    IF QUALF (CTRL) = SPACES ADD 1 TO CTRL GO TO P-REC9-LOOP.
    MOVE QUALF (CTRL) TO QUAL-W.
    IF NOT QUALF-OK MOVE 'QUALIFICATION ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    ADD 1 TO CTRL.
    GJ TO P-REC9-LOOP.
P-REC-10.
    EXAMINE STAFF-1 REPLACING LEADING SPACES BY ZEROS.
    EXAMINE STAFF-2 REPLACING LEADING SPACES BY ZEROS.
    EXAMINE STAFF-3 REPLACING LEADING SPACES BY ZEROS.
    EXAMINE STAFF-4 REPLACING LEADING SPACES BY ZEROS.
    IF STAFF-1 NOT NUMERIC OR
       STAFF-2 NOT NUMERIC OR
       STAFF-3 NOT NUMERIC OR
       STAFF-4 NOT NUMERIC
    MOVE 'NO. OF STAFF ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
    GJ TO P-WRITE-OUT.
P-REC-11.
    EXAMINE PERS-LOCAL REPLACING LEADING SPACES BY ZEROS.
    EXAMINE PERS-AID REPLACING LEADING SPACES BY ZEROS.
    EXAMINE OPER-LOCAL REPLACING LEADING SPACES BY ZEROS.
    EXAMINE OPER-AID REPLACING LEADING SPACES BY ZEROS.

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IF RECURRENT-1 NOT NUMERIC
  MOVE 'RECURRENT AMOUNT ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
GO TO P-WRITE-OUT.
P-REC-12.
EXAMINE CAPITAL-1 REPLACING LEADING SPACES BY ZEROS.
EXAMINE CAPITAL-2 REPLACING LEADING SPACES BY ZEROS.
EXAMINE CAPITAL-3 REPLACING LEADING SPACES BY ZEROS.
EXAMINE CAPITAL-4 REPLACING LEADING SPACES BY ZEROS.
EXAMINE CAPITAL-5 REPLACING LEADING SPACES BY ZEROS.
IF CAPITAL-1 NOT NUMERIC OR
  CAPITAL-2 NOT NUMERIC OR
  CAPITAL-3 NOT NUMERIC OR
  CAPITAL-4 NOT NUMERIC OR
  CAPITAL-5 NOT NUMERIC
  MOVE 'CAPITAL COST AMOUNT ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
GO TO P-WRITE-OUT.
P-WRITE-OUT.
IF SW1 = 1 MOVE 0 TO SW1 GO TO P-READ.
WRITE OUTREC FROM WORKREC-01.
GO TO P-READ.
P-ERROR.
PERFORM P-HEAD THRU P-HEAD-EXIT.
MOVE 1 TO SW1.
MOVE WINST-CODE TO LI-INST-CODE.
MOVE WSJRV-YR TO LI-SURV-YR.
MOVE REC-TYPE TO LI-REC-TYPE.
IF REC-TYPE = '03' MOVE TYPE32 TO LI-ITEM-CODE.
IF REC-TYPE = '04' MOVE RITEM-CODE TO LI-ITEM-CODE.
IF REC-TYPE = '09' MOVE REC-TYPE92 TO LI-ITEM-CODE.
MOVE PRG-NO TO LI-PRG.
MOVE PROJ-NO TO LI-PROJ.
WRITE LP-REC FROM LINE1 AFTER 2.
MOVE SPACES TO LINE1.
SUBTRACT 2 FROM LCT.
P-ERROR-EXIT.
EXIT.
P-DEL-REST-TYPES.
MOVE BATCH-NO TO WBATCH-NO.
P-RD.
MOVE SPACES TO WORKREC-01.
READ TAPEFILE INTO WORKREC-01 AT END GO TO P-END.
IF BATCH-NO NOT = WBATCH-NO GO TO P-REST-EXIT.
MOVE ' -DU-' TO LI-ERROR.
PERFORM P-ERROR THRU P-ERROR-EXIT.
MOVE 0 TO SW1.
GO TO P-RD.
P-REST-EXIT.
EXIT.
P-SEARCH-PRGNO.
MOVE 0 TO GEN-IND-1.
MOVE 1 TO CTR.
P-SPRJG-LP.
IF CTR > 500 GO TO P-PRG-EXIT.
IF PROGRAMME-NO = WTPROG-NO (CTR)
  MOVE 1 TO GEN-IND-1
  GO TO P-PRJG-EXIT.
ADD 1 TO CTR.
GO TO P-SPRJG-LP.
P-PRG-EXIT.
EXIT.
P-SEARCH-PROJNO.
MOVE 0 TO GEN-IND-2.
MOVE 1 TO CTR.
P-SPROJ-LP.

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        IF CTR > 500 GO TO P-PROJ-EXIT.
        IF PROJECT-NO = WTPROJ-NO (CTR)
            MOVE 1 TO GEN-IND-2
            GO TO P-PROJ-EXIT.
        ADD 1 TO CTR.
        GO TO P-SPROJ-LP.
P-PROJ-EXIT.
    EXIT.
P-HEAD.
    IF LCT > 0 GO TO P-HEAD-EXIT.
    ADD 1 TO PAGE-CT.
    MOVE PAGE-CT TO H1PAGE.
    WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
    WRITE LP-REC FROM HEAD2 AFTER 2.
    WRITE LP-REC FROM HEAD3 AFTER 2.
    WRITE LP-REC FROM HEAD4 AFTER 1.
    WRITE LP-REC FROM HEAD5 AFTER 2.
    WRITE LP-REC FROM HEAD6 AFTER 1.
    MOVE 50 TO LCT.
P-HEAD-EXIT.
    EXIT.
P-END.
    CLOSE TAPEFILE TAPEOUT PROG-FILE
        PROJ-FL PRINT-FL.
    STOP RUN.

/*
// LBLTYP TAPE
// EXEC LNKEDT
//
* $E EDJ

```

(iv) PROGRAM RAARP83

(a) Program Description

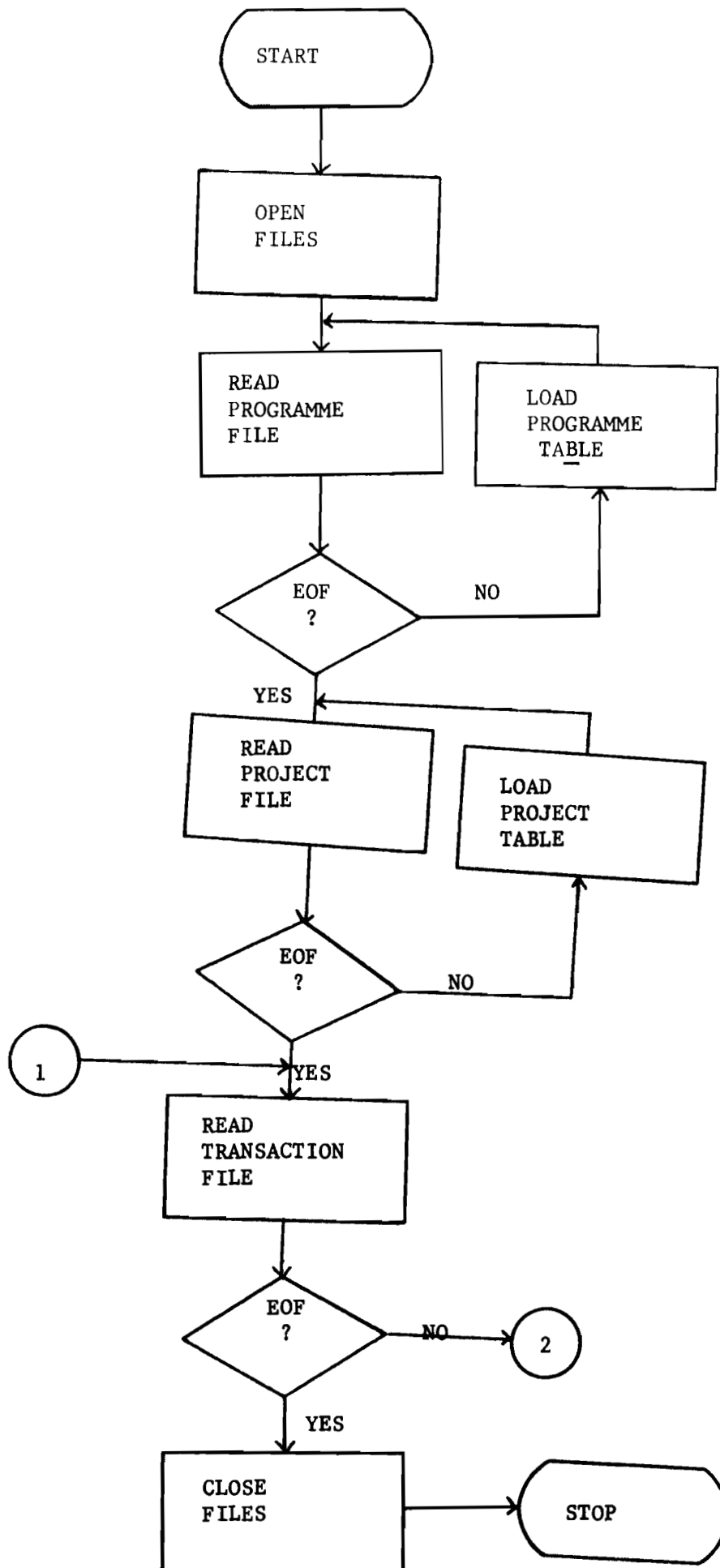
3.21 This program is similar to RAARP82, but the only difference is the input media and the record layout. It is regularly used to validate the amendment records before they are used to update the master file.

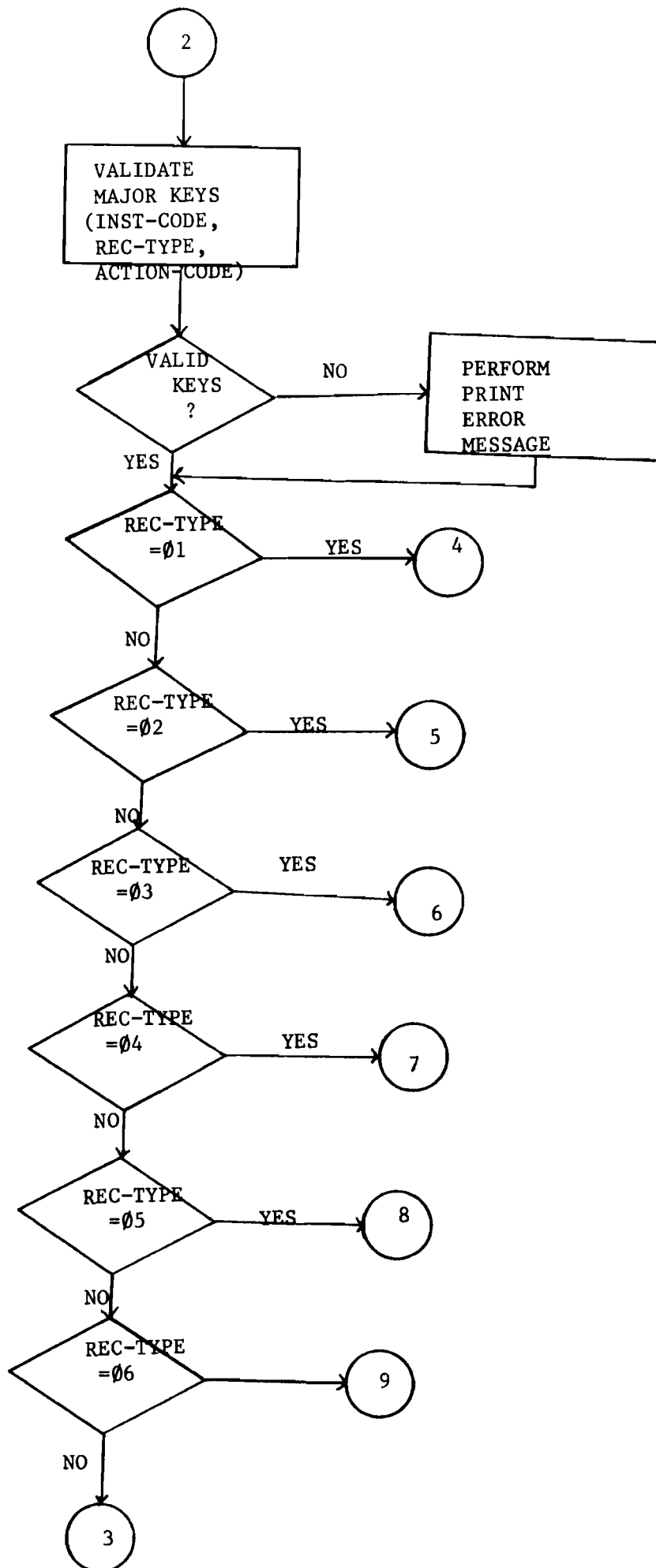
3.22 INPUT - (1) RAARINPT on diskette (see 2.7 through 2.20)
(2) RAARPROJ-DATA on magnetic tape (see 2.38)
(3) RAARPROG-DATA on magnetic tape (see 2.39)

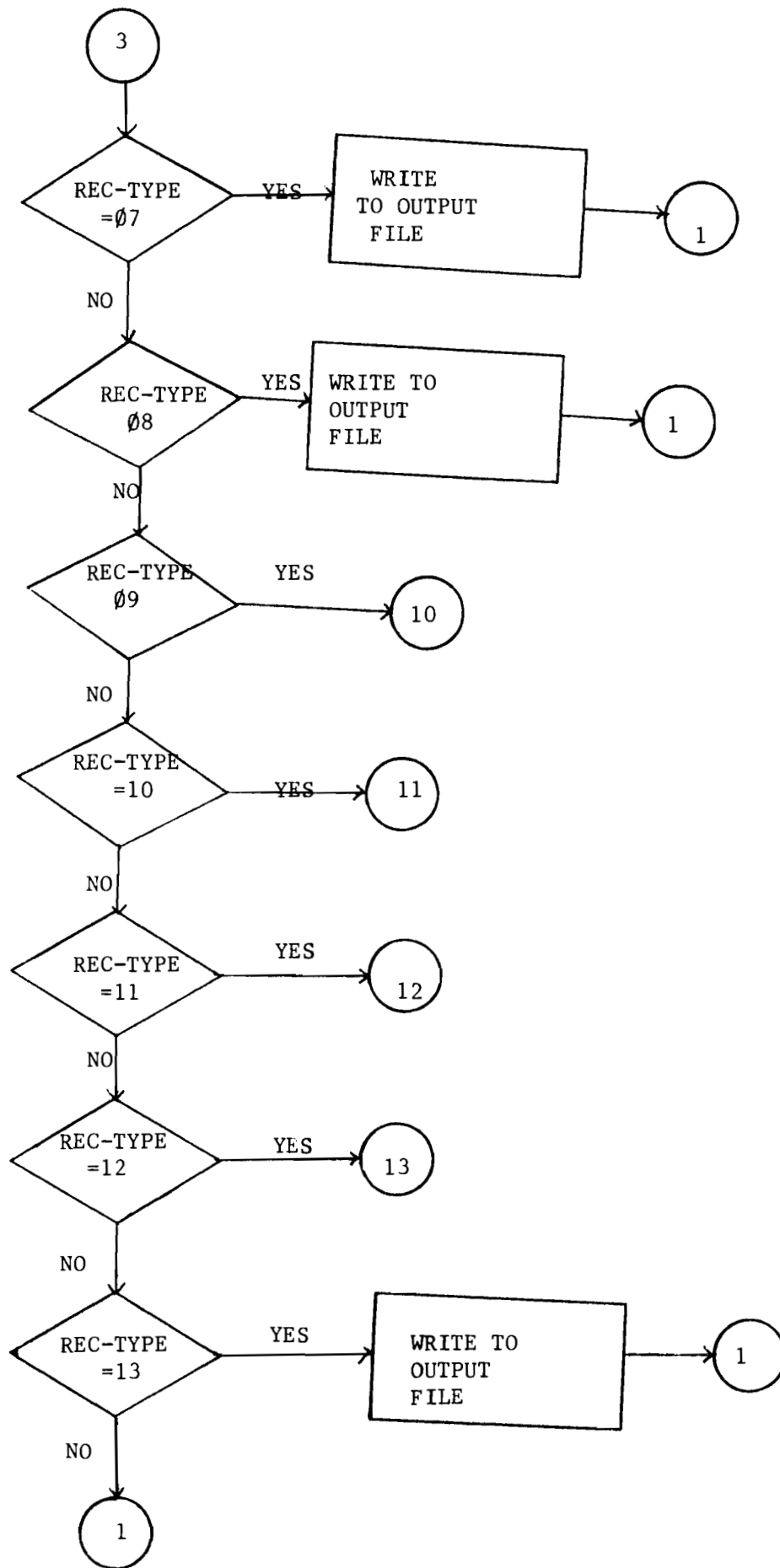
OUTPUT - (1) Printout LIST 83 entitled 'VALIDATION ERROR LIST (AMEND-
MENTS)' (see appendices II &
III)
(2) RAARTRAN on disk.

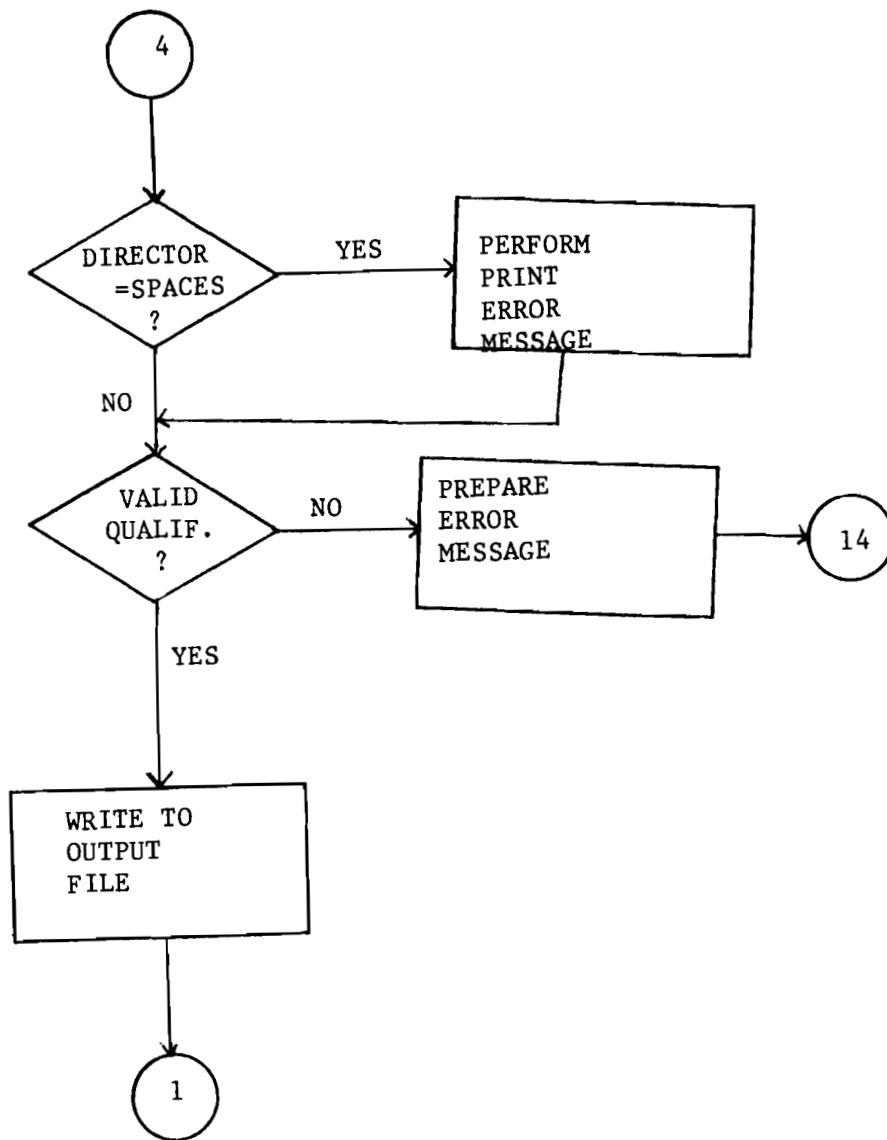
(b) Program Procedure

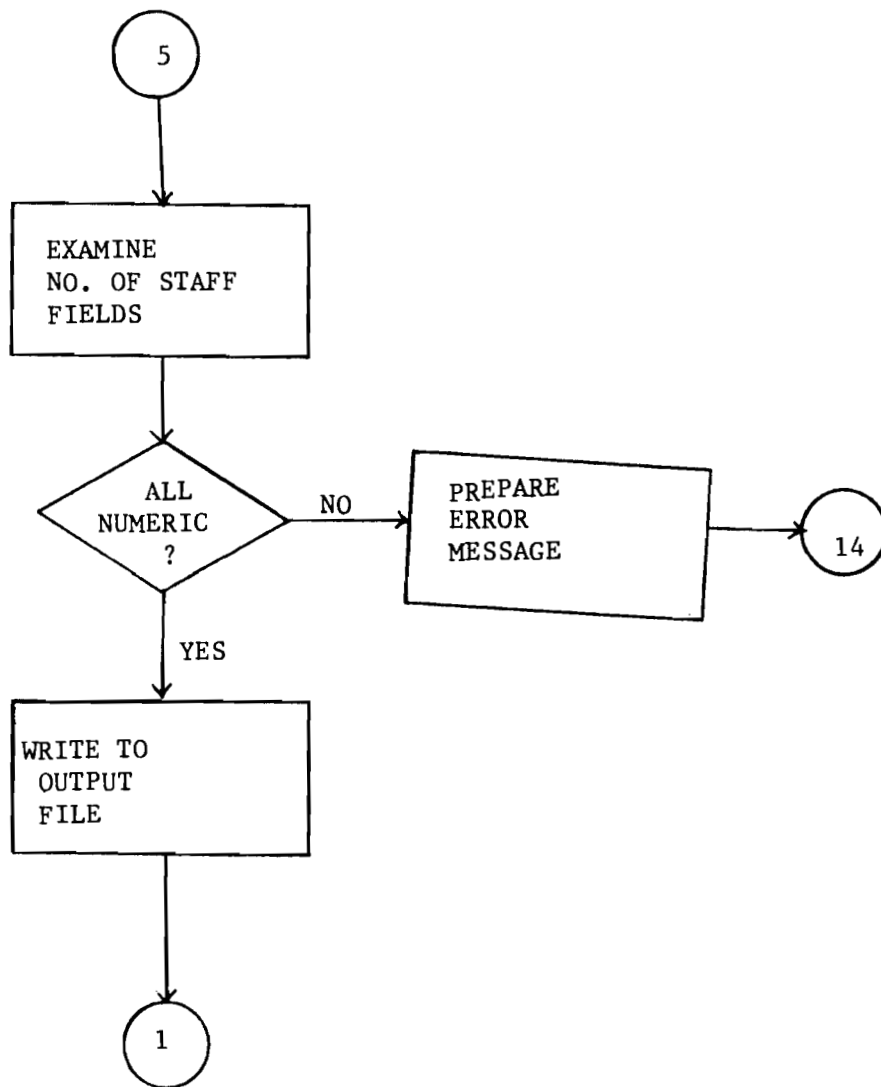
3.23 The procedure is similar to that of RAARP82. In addition to the common fields, the amendment action code is checked if it is an "A", "D" or "I". For record types 01 through 05 and 07 through 13 the validation is the same as that of RAARP82. For record type 06, the same validation check is applied but if it is in error only that record type 06 is rejected. The pertinent program flowchart and listing are appended below.

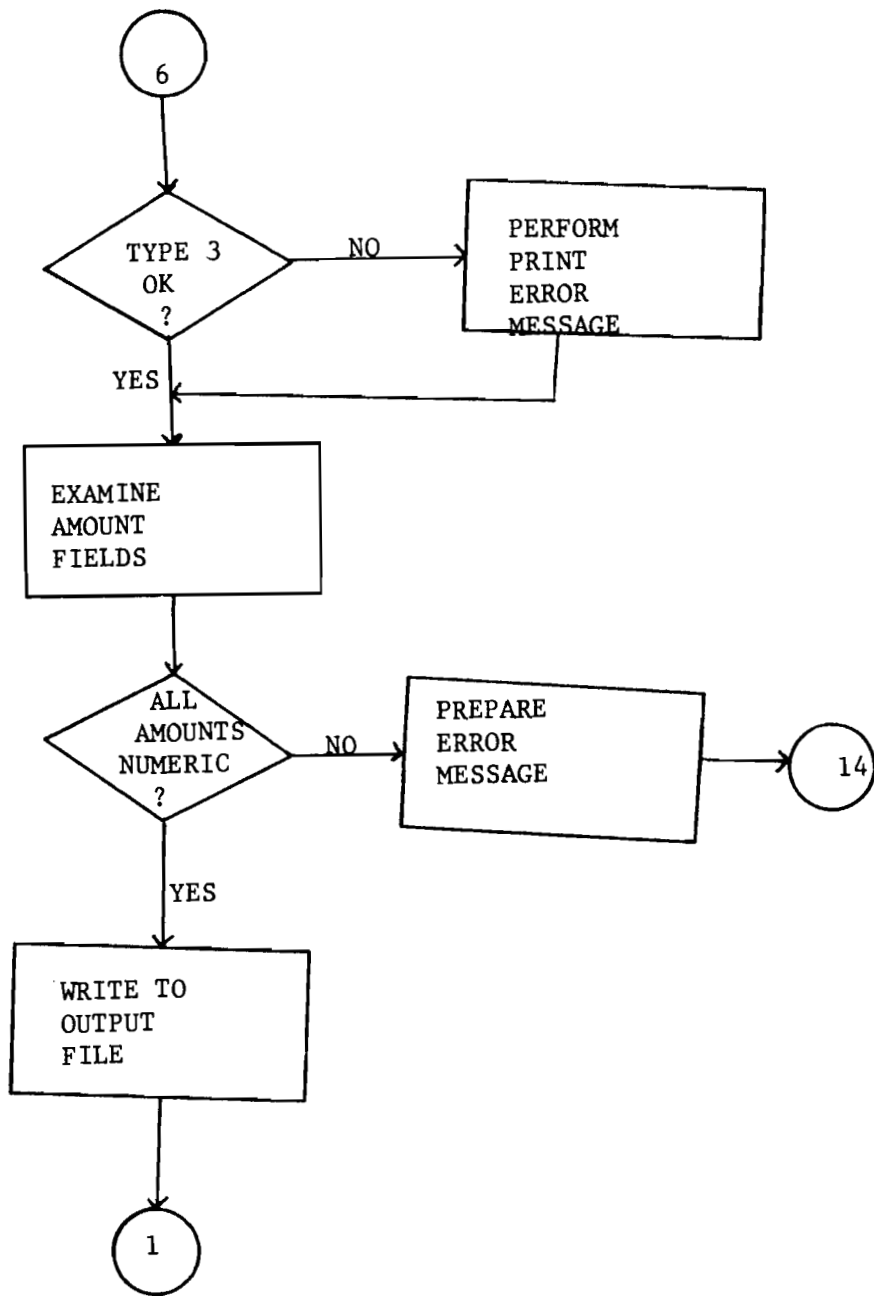


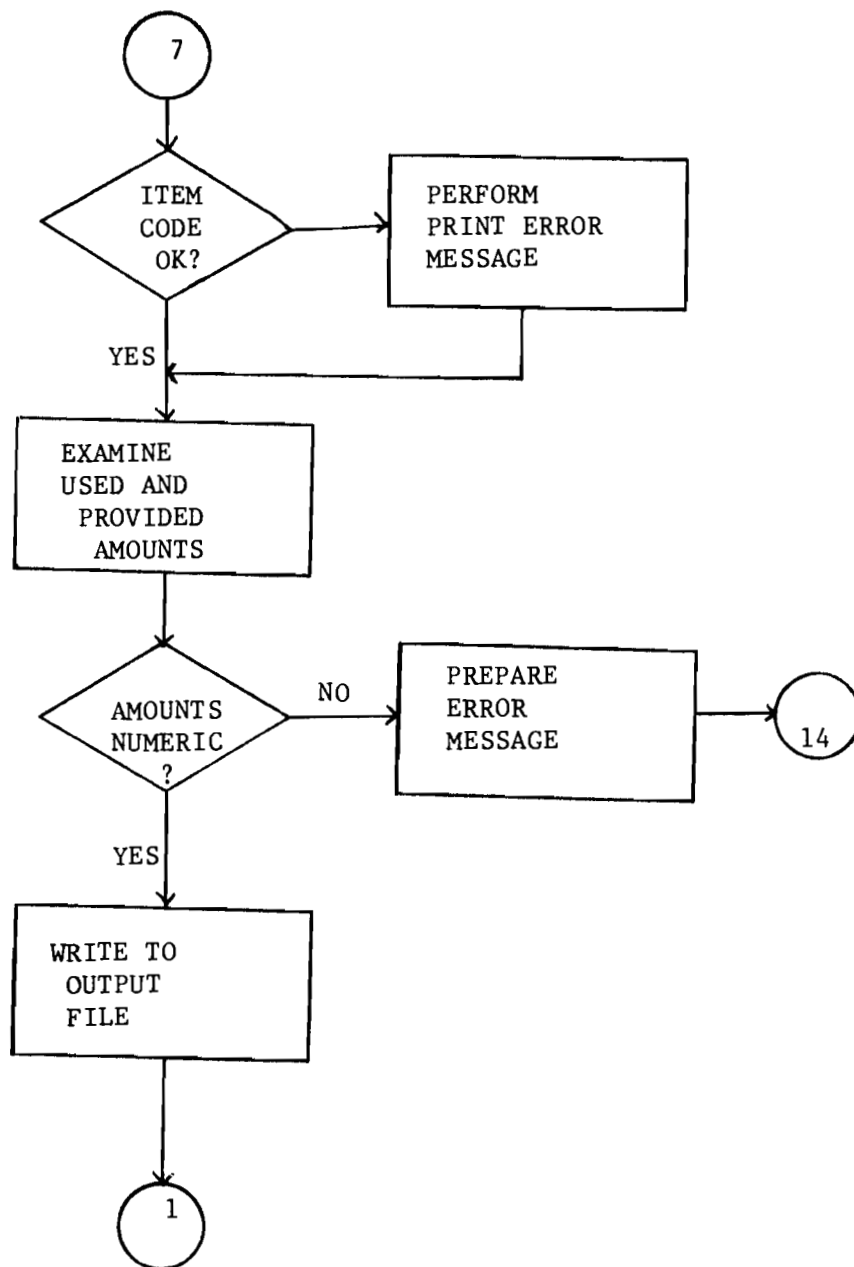


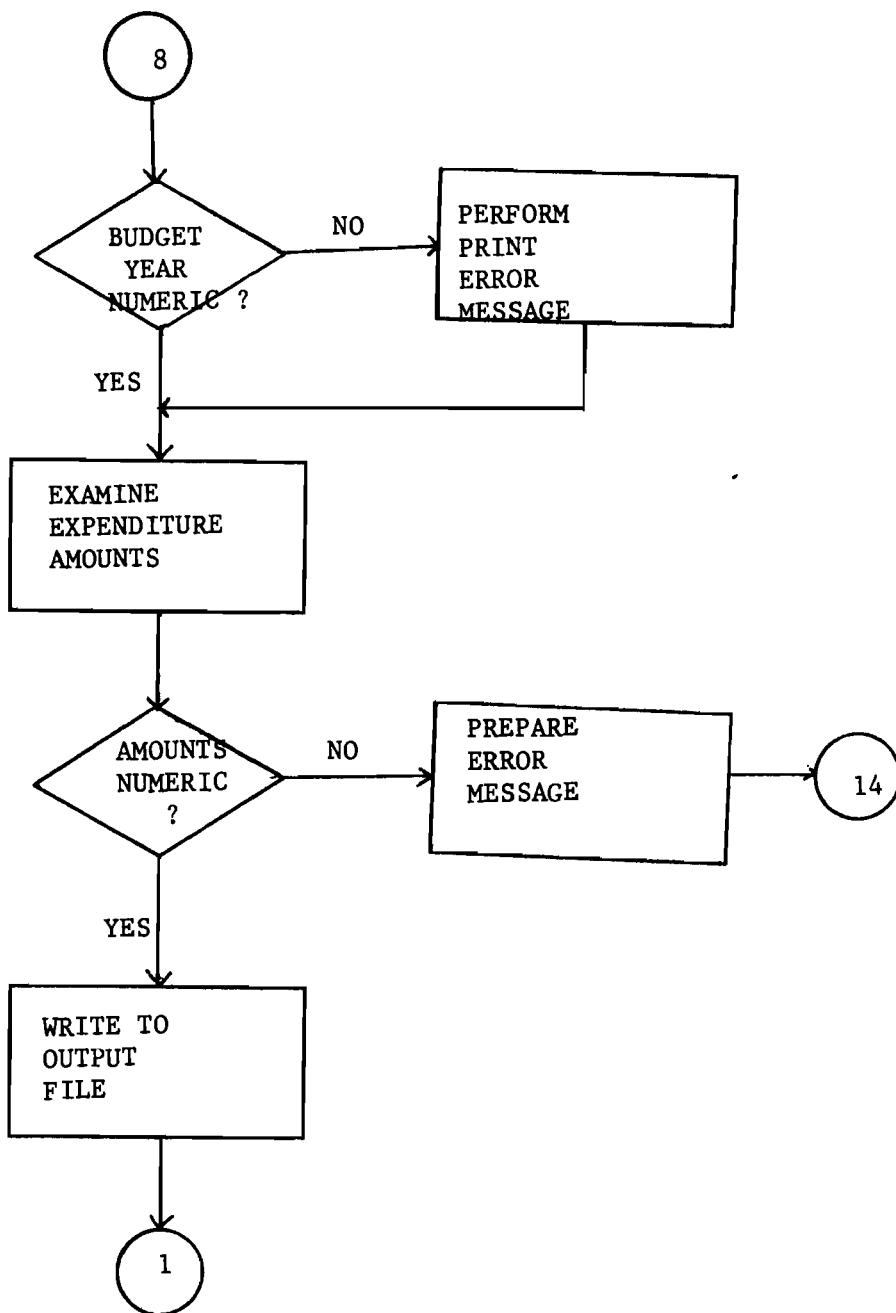


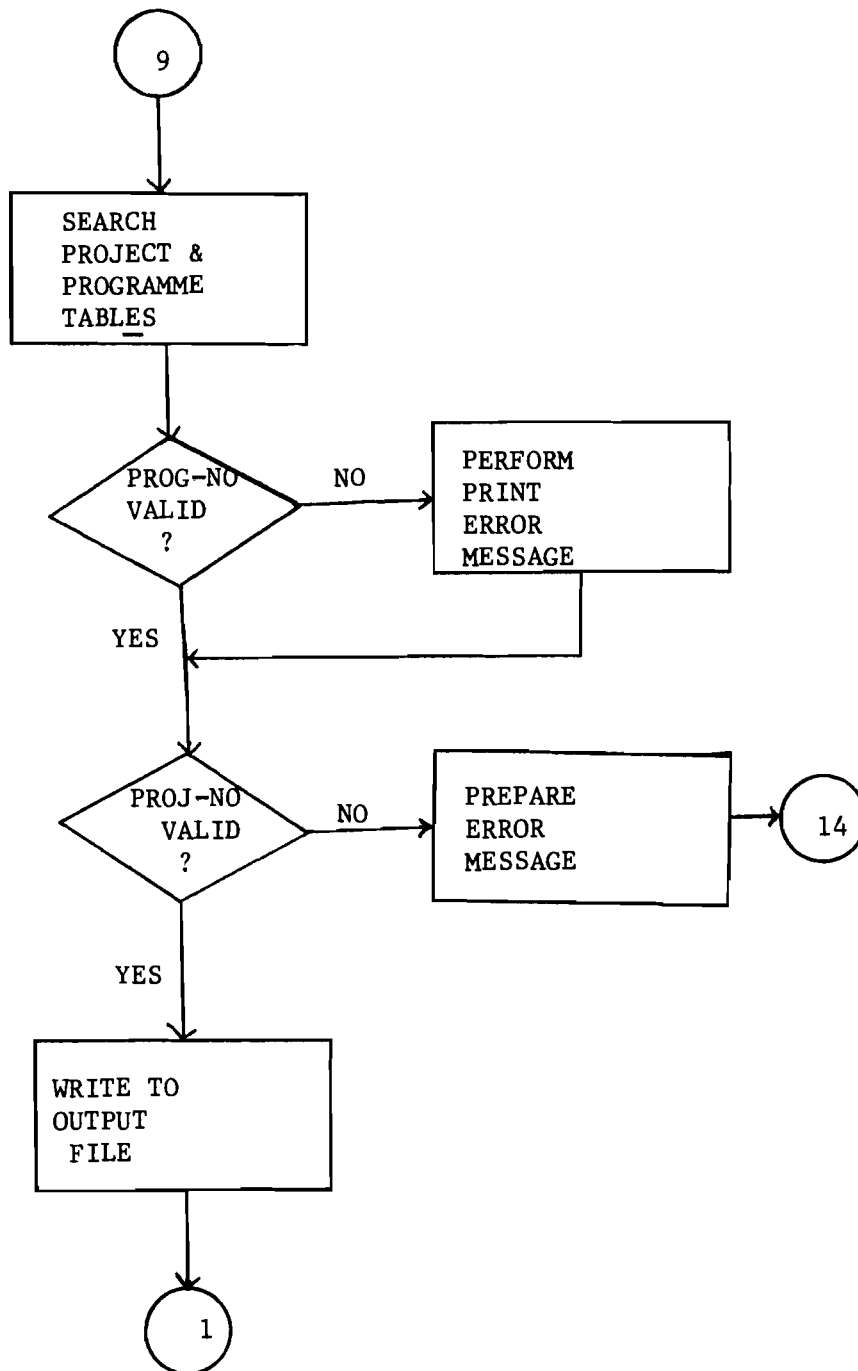


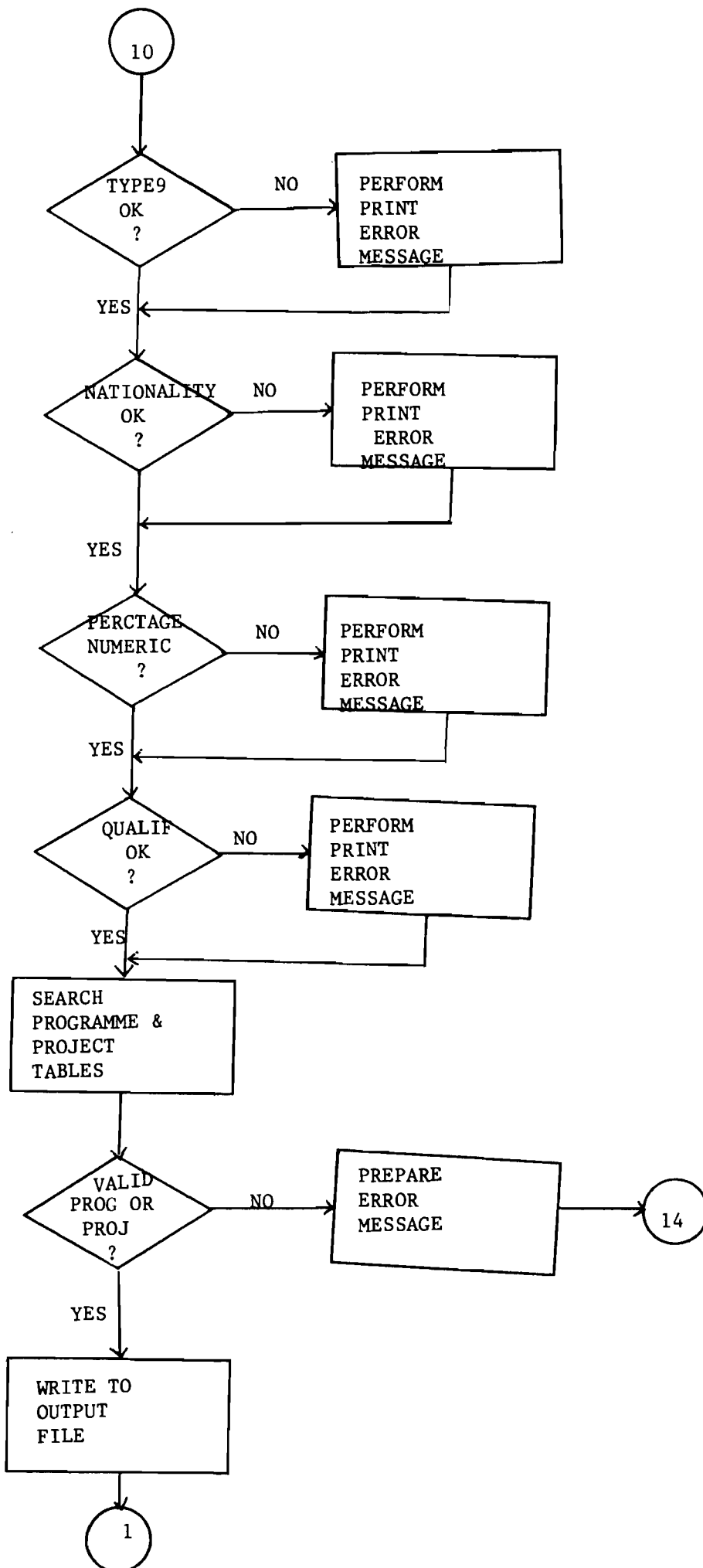


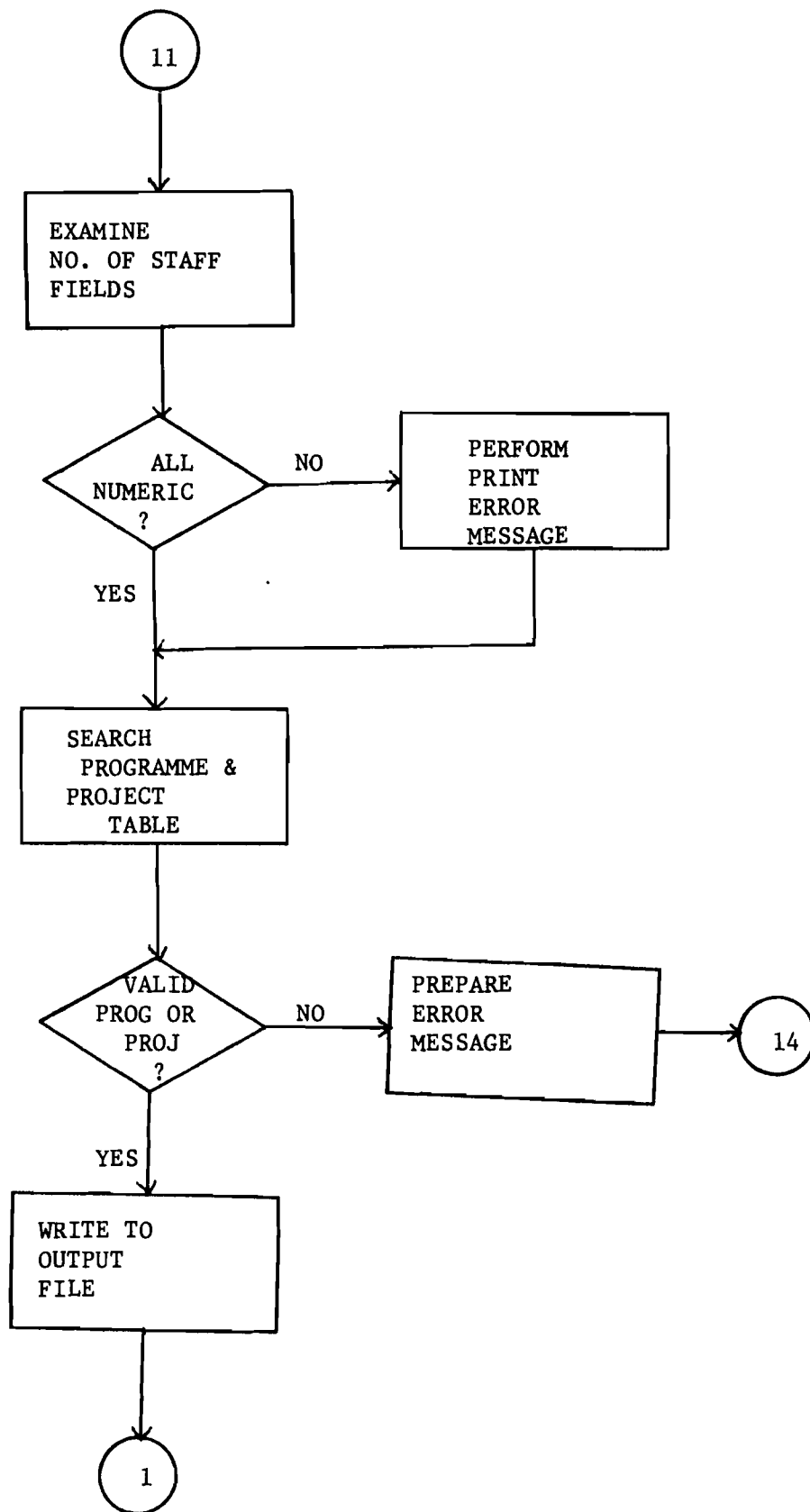


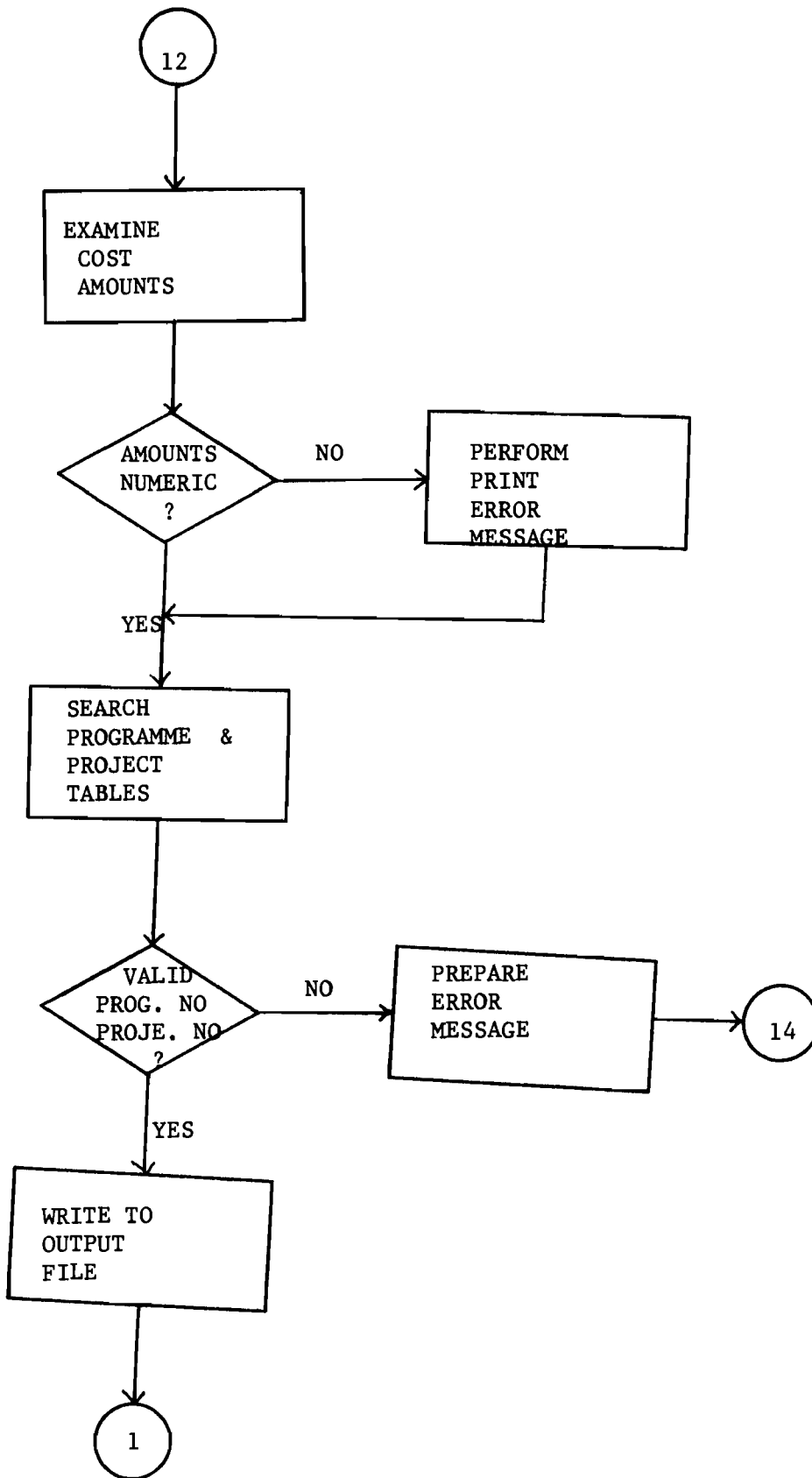


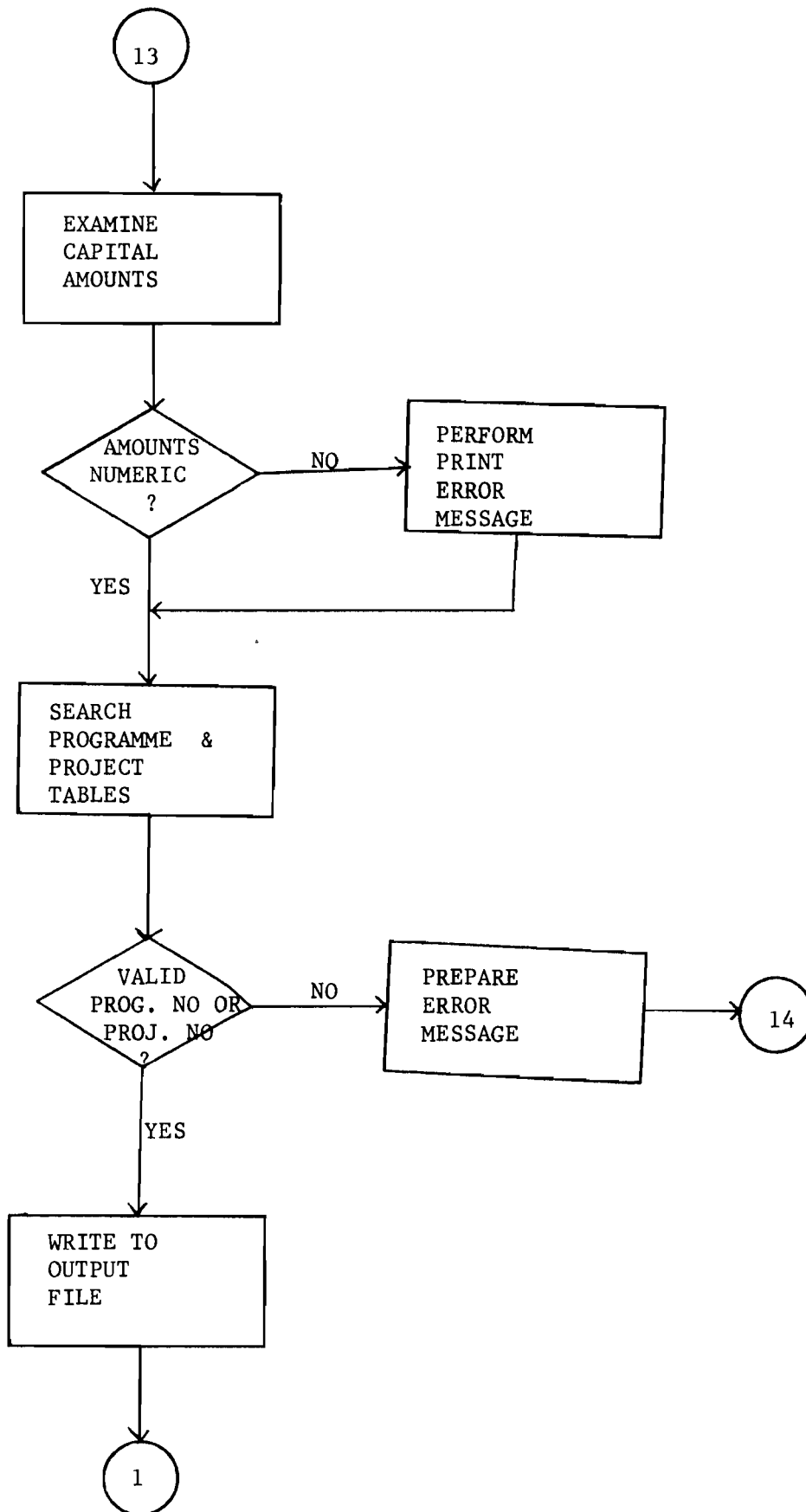


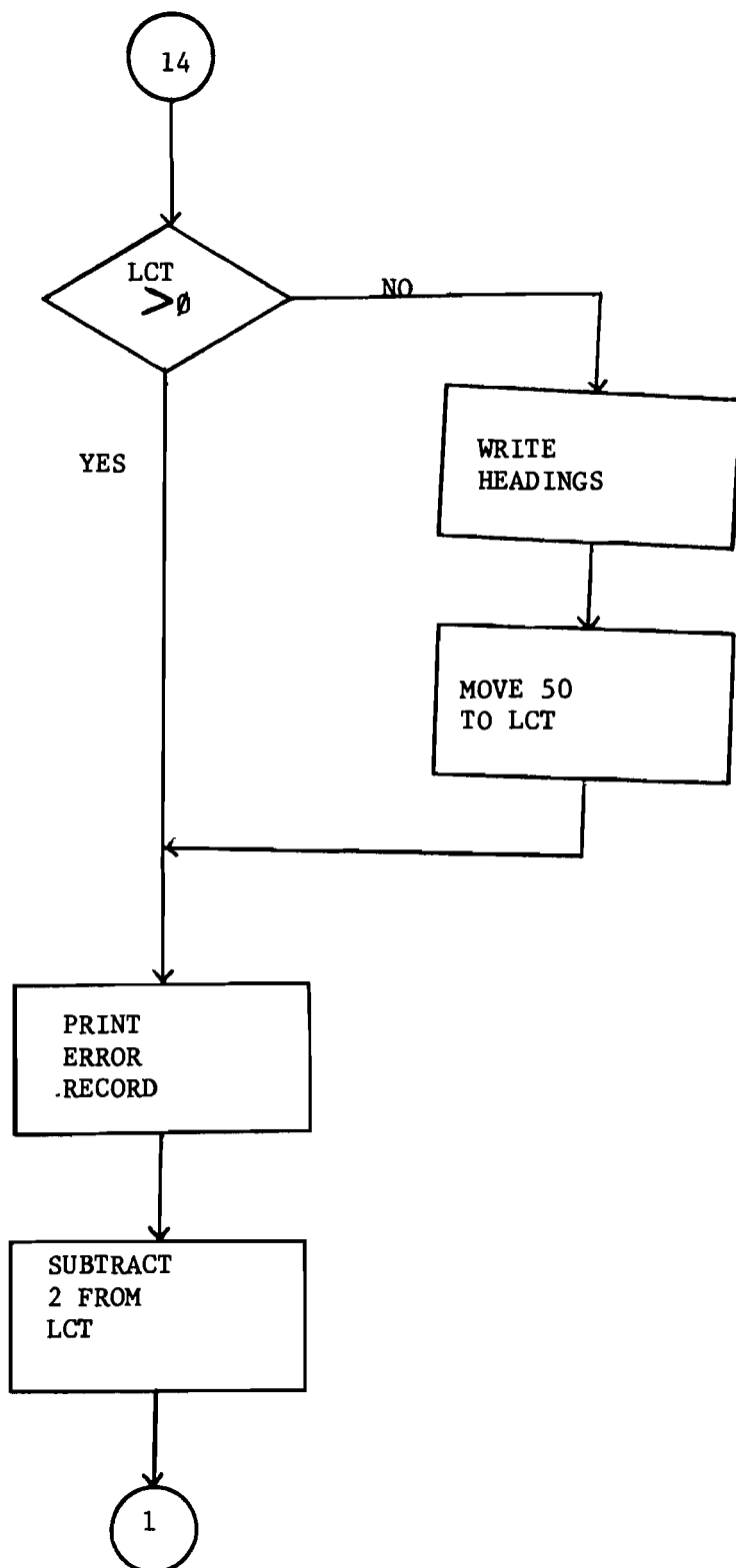












(d) PROGRAM LISTING - RAARP83

```
* ** JCB JNM=RAARP83,CLASS=A,USER=OPS04000
// JCB RAARP83                VALIDATION PROGRAM
// LIBDEF CL,TJ=JSRCL2
// OPTION CATAL
  PHASE RAARP83,*
// EXEC FCDBJL,SIZE=64K
CBL NOSEQ,CLIST,SXREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
  PROGRAM-ID. RAARP83.
  AUTHOR. CKC, AWK, AMK, NKM.
  ENVIRONMENT DIVISION.
  CONFIGURATION SECTION.
  SOURCE-COMPUTER. IBM-370.
  OBJECT-COMPUTER. IBM-370.
  SPECIAL-NAMES. CO1 IS NEWPAGE SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT PRINT-FL    ASSIGN TO SYS027-JR-1403-S.
    SELECT DISK-FL     ASSIGN TO SYS001-UT-3540-S.
    SELECT TAPEOUT     ASSIGN TO SYS002-UT-3420-S.
    SELECT PROJ-FL     ASSIGN TO SYS003-JT-3420-S.
    SELECT PROG-FILE   ASSIGN TO SYS025-JR-2501-S.

  DATA DIVISION.
  FILE SECTION.
    FD PRINT-FL        RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORD IS LP-REC.
    01 LP-REC.
      02 FILLER          PIC X(133).
  *
    FD DISK-FL         RECORDING MODE IS F
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS DISK-REC.
  *
    * VALUE OF ID IS 'RAARDATA'.
    01 DISK-REC.
      02 FILLER          PIC X(128).
    FD PROJ-FL         RECORDING MODE IS F
      BLOCK CONTAINS 8000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS PROJ-REC.
  *
    * VALUE OF ID IS 'RAARPROJ-DATA'.
    01 PROJ-REC.
      02 PROJ-NO-1       PIC 9(15).
      02 FILLER          PIC X.
      02 PROJ-NAME-1     PIC X(64).
  *
    FD PROG-FILE       RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORD IS PROG-REC.
  *
    * VALUE OF ID IS 'RAARPROG-DATA'.
    01 PROG-REC.
      02 PROG-NO-1       PIC 9(15).
      02 FILLER          PIC X.
      02 PROG-NAME-1     PIC X(64).
  *
    FD TAPEOUT         RECORDING MODE IS F
      BLOCK CONTAINS 6400 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS OUTREC.
  *
    * VALUE OF ID IS 'RAARTRAV'.
    01 OUTREC.
      02 FILLER          PIC X(128).
  WORKING-STORAGE SECTION.
  77 CTR                PIC 999 VALUE 0.
  77 PAGE-CT            PIC 999 VALUE 0.
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77 LCT PIC 999 VALUE 0.
77 SW1 PIC 9 VALUE 0.
77 GEN-IND-1 PIC 9 VALUE 0.
77 GEN-IND-2 PIC 9 VALUE 0.
77 CTR1 PIC 99 VALUE 0.
77 CTR2 PIC 99 VALUE 0.
01 STORE-1.
02 QUAL-W PIC XX.
08 QUALF-OK VALUE '01' THRU '09'.
01 WID-NO.
02 INST-CODE PIC X(03).
02 SURV-YEAR PIC XX.
02 WREC-TYPE PIC 99.
01 STORE-2.
02 WPRDNO PIC X(15).
02 WPRJNO PIC X(15).
*
01 WORKREC-01.
02 WINST-CODE PIC X(03).
08 INST-OK VALUE '001' THRU '005' '010' THRU '017'
'020' THRU '025' '030' THRU '052'
'055' '061' THRU '083' '099' THRU '101'
'200' THRU '210' '300' THRU '306'
'400' THRU '402'.
02 WSURV-YR PIC XX.
02 ACTION-CODE PIC X.
08 ACT-OK VALUE 'A' 'D' 'I'.
02 REC-TYPE PIC XX.
08 REC-TYPE-OK VALUE '01' THRU '13'.
02 WDIRECTOR-NM PIC X(15).
02 WQUAL.
03 QUAL-1 PIC XX OCCURS 5.
02 FILLER PIC X(095).
01 WORKREC-02 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 WYEARS.
03 WPHDYEAR OCCURS 10.
04 WPHD-1 PIC XX.
03 WMSCYEARS OCCURS 10.
04 WMSC-1 PIC XX.
03 WBSCYEARS OCCURS 10.
04 WBSC-1 PIC XX.
02 FILLER4.
03 WSEN-TECH PIC XX.
03 WTECH PIC XX.
03 WTECHN PIC XX.
03 WEXEC PIC XX.
03 WCLER PIC XX.
03 WARTSAN PIC XX.
03 WUNSKIL PIC XXX.
02 FILLER PIC X(45).
01 WORKREC-03 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 TYPE32 PIC X.
08 TYPE-OK VALUE '1' '2'.
02 REC-DEV-AMT.
03 AMT-1 PIC X(07) OCCURS 10.
02 FILLER PIC X(49).
01 WORKREC-04 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 RITEM-CODE PIC X(03).
08 CODE-OK VALUE '000' '050' '100' '110' '120' '140'
'150' '151' '153' '154' '160' '172'
'173' '174' '180' '190' '200' '210'
'220' '222' '250' '302' '340'.
02 FILLER PIC X(09).

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02 REXP.
    03 RPROVIDED PIC X(07).
    03 RUSED PIC X(07).
02 FILLER PIC X(094).
01 WORKREC-05 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 BUDG-YR1 PIC XX.
02 EXP-1 PIC X(07).
02 EXPED11 REDEFINES EXP-1 PIC 9(07).
02 BUDG-YR2 PIC XX.
02 EXP-2 PIC X(07).
02 EXPED22 REDEFINES EXP-2 PIC 9(07).
02 FILLER PIC X(102).
01 WORKREC-06 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 PROGRAMME-NO.
    03 RREF-NO-1 PIC XXX.
    03 RCAT-1 PIC X.
    03 RSUBJ-1 PIC XXX.
    03 RFFDR-1 PIC XX.
    03 RYEAR-1 PIC XX.
    03 RSERIAL-1 PIC X(04).
02 PROJECT-NO.
    03 RREF-NO-2 PIC X(03).
    03 RCAT-2 PIC X.
    03 RSUBJ-2 PIC XXX.
    03 RFFDR-2 PIC XX.
    03 RYEAR-2 PIC XX.
    03 RSERIAL-2 PIC X(04).
02 FILLER PIC X(90).
*
01 WORKREC-09 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 REC-TYPE92 PIC X.
    88 TYPE9-OK VALUE '1' THRU '9'.
02 FILLER PIC X(17).
02 QUALF PIC XX OCCURS 5.
02 RES-EXP PIC XX.
02 NATIONALITY PIC XX.
    88 <-OK VALUE '01' '02'.
02 PERCT-1 PIC X(03).
02 FILLER PIC X(55).
02 PROG-NO PIC X(15).
02 PROJ-NO PIC X(15).
01 WORKREC-10 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 STAFF-1 PIC XX.
02 FILLER PIC X(08).
02 STAFF-2 PIC XX.
02 FILLER PIC X(08).
02 STAFF-3 PIC XX.
02 FILLER PIC X(08).
02 STAFF-4 PIC XX.
02 FILLER PIC X(088).
*
01 WORKREC-11 REDEFINES WORKREC-01.
02 FILLER PIC X(08).
02 RECURRENT-1.
    03 PERS-LOCAL PIC X(07).
    03 PERS-AID PIC X(07).
    03 OPER-LOCAL PIC X(07).
    03 OPER-AID PIC X(07).
02 FILLER PIC X(092).
01 WORKREC-12 REDEFINES WORKREC-01.
02 FILLER PIC X(18).
02 CAPITAL-COST.

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03 CAPITAL-1          PIC X(07).
03 FILLER             PIC X(10).
03 CAPITAL-2          PIC X(07).
03 FILLER             PIC X(10).
03 CAPITAL-3          PIC X(07).
03 FILLER             PIC X(10).
03 CAPITAL-4          PIC X(07).
03 FILLER             PIC X(10).
03 CAPITAL-5          PIC X(07).
02 FILLER             PIC X.
02 RDATE-1            PIC XX.
02 RDATE-2            PIC XX.
02 FILLER             PIC X(30).
01 WORKREC-13 REDEFINES WORKREC-01.
02 FILLER             PIC X(08).
02 DESIG-INT          PIC X.
02 QUIZES             PIC X(63).
02 FILLER             PIC X(56).

*
01 PROJ-TABLE.
02 WTPROJ-NO          PIC X(15) OCCURS 500.
02 WTPROJ-NAME        PIC X(64) OCCURS 500.
01 PROG-TABLE.
02 WTPROG-NO          PIC X(15) OCCURS 500.
02 WTPROG-NAME        PIC X(64) OCCURS 500.
01 LINE1.
02 FILLER             PIC X(13).
02 LI-INST-CODE       PIC XXX.
02 FILLER             PIC X(11).
02 LI-SURV-YR         PIC XX.
02 FILLER             PIC X(15).
02 LI-REC-TYPE        PIC XX.
02 LI-ITEM-CODE       PIC X(03).
02 FILLER             PIC X(11).
02 LI-PROG            PIC X(15).
02 FILLER             PIC X(04).
02 LI-PROJ            PIC X(15).
02 FILLER             PIC X(04).
02 LI-ERROR          PIC X(35).
01 HEAD1.
02 FILLER             PIC X(03) VALUE SPACES.
02 HDATE              PIC X(08) VALUE SPACES.
02 FILLER             PIC X(14) VALUE SPACES.
02 FILLER             PIC X(55) VALUE
    'N A T I O N A L C O U N C I L F O R S C I E N C E '.
02 FILLER             PIC X(30) VALUE
    ' A N D T E C H N O L O G Y '.
02 FILLER             PIC X(11) VALUE SPACES.
02 FILLER             PIC X(05) VALUE 'PAGE:'.
02 H1PAGE             PIC Z9.
02 FILLER             PIC X(04) VALUE SPACES.
01 HEAD2.
02 FILLER             PIC X(45) VALUE SPACES.
02 FILLER             PIC X(45) VALUE
    'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER             PIC X(43) VALUE SPACES.
01 HEAD3.
02 FILLER             PIC X(10) VALUE SPACES.
02 FILLER             PIC X(12) VALUE 'L I S T 83'.
02 FILLER             PIC X(33) VALUE SPACES.
02 FILLER             PIC X(34) VALUE
    'VALIDATION ERROR LIST-(AMENDMENTS)'.
02 FILLER             PIC X(44) VALUE SPACES.
01 HEAD4.
02 FILLER             PIC X(55) VALUE SPACES.
02 FILLER             PIC X(34) VALUE ALL '-'.

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02 FILLER      PIC X(44) VALUE SPACES.
01 HEAD5.
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(10) VALUE 'INST. CODE'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(10) VALUE 'SURV. YEAR'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(18) VALUE 'REC-TYPE/ITEM-CODE'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(16) VALUE 'PROGRAMME NUMBER'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(15) VALUE 'PROJECT NUMBER'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(25) VALUE
'E R R O R   M E S S A G E'.
02 FILLER      PIC X(09) VALUE SPACES.
01 HEAD6.
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(10) VALUE ALL '--'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(10) VALUE ALL '--'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(18) VALUE ALL '--'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(16) VALUE ALL '--'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(15) VALUE ALL '--'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(25) VALUE ALL '--'.
02 FILLER      PIC X(09) VALUE SPACES.
PROCEDURE DIVISION.
P-START.
    OPEN INPUT  DISK-FL PROG-FILE PROJ-FL
              OUTPUT PRINT-FL TAPEOUT.
    MOVE CURRENT-DATE TO HDATE.
    MOVE SPACES TO LINE1.
    MOVE 1 TO CTR.
P-READ-PROJ.
    READ PROJ-FL AT END MOVE 1 TO CTR GO TO P-READ-PRG.
    IF CTR > 500 GO TO P-PROJ-T-FULL.
    MOVE PROJ-NO-1 TO WTPROJ-NO (CTR).
    MOVE PROJ-NAME-1 TO WTPROJ-NAME (CTR).
    ADD 1 TO CTR.
    GO TO P-READ-PROJ.
P-PROJ-T-FULL.
    DISPLAY 'PROJECT TABLE FULL' CTR.
    STOP 'RUN ABANDONED'.
    STOP RUN.
P-READ-PRG.
    READ PRG-FILE AT END GO TO P-READ.
    IF CTR > 500 GO TO P-PRG-T-FULL.
    MOVE PRG-NO-1 TO WTPROG-NO (CTR).
    MOVE PRG-NAME-1 TO WTPROG-NAME (CTR).
    ADD 1 TO CTR.
    GO TO P-READ-PRG.
P-PRG-T-FULL.
    DISPLAY 'PROGRAMME TABLE FULL'.
    STOP 'RUN ABANDONED'.
    STOP RUN.
P-READ.
    MOVE SPACES TO WORKREC-01.
    READ DISK-FL INTO WORKREC-01 AT END GO TO P-END.
P-MAIN-KEYS.
    IF NOT INST-OK MOVE 'INST. CODE ERROR' TO LI-ERROR
                    PERFORM P-ERROR THRU P-ERROR-EXIT.
    IF NOT REC-TYPE-OK MOVE 'REC TYPE ERROR' TO LI-ERROR

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        PERFORM P-ERROR THRU P-ERROR-EXIT.
IF WSJRV-YR NOT NUMERIC MOVE 'SURVEY YEAR ERROR' TO L1-ERROR
        PERFORM P-ERROR THRU P-ERROR-EXIT.
IF NOT ACT-OK
        MOVE 'ACTION CODE ERROR' TO L1-ERROR
        PERFORM P-ERROR THRU P-ERROR-EXIT.
P-SELECT.
        IF REC-TYPE = '07' OR
           REC-TYPE = '08' OR
           REC-TYPE = '13' GO TO P-WRITE-OUT.
        IF REC-TYPE = '01' GO TO P-REC-01.
        IF REC-TYPE = '02' GO TO P-REC-02.
        IF REC-TYPE = '03' GO TO P-REC-03.
        IF REC-TYPE = '04' GO TO P-REC-04.
        IF REC-TYPE = '05' GO TO P-REC-05.
        IF REC-TYPE = '06' GO TO P-REC-06.
        IF REC-TYPE = '09' GO TO P-REC-09.
        IF REC-TYPE = '10' GO TO P-REC-10.
        IF REC-TYPE = '11' GO TO P-REC-11.
        IF REC-TYPE = '12' GO TO P-REC-12.
        GO TO P-READ.
P-REC-01.
        IF WDIRECTOR-NM = SPACES
                MOVE 'DIRECTOR NAME ERROR' TO L1-ERROR
                PERFORM P-ERROR THRU P-ERROR-EXIT.

        MOVE 1 TO CTR1.
P-QUAL-LOOP.
        IF CTR1 > 5 GO TO P-WRITE-OUT.
        IF QUAL-1 (CTR1) = SPACES ADD 1 TO CTR1 GO TO P-QUAL-LOOP.
        EXAMINE QUAL-1 (CTR1) REPLACING LEADING SPACES BY ZEROS.
        MOVE QUAL-1 (CTR1) TO QUAL-W.
        IF NOT QUALF-OK MOVE 'QUALIFICATION ERROR' TO L1-ERROR
                PERFORM P-ERROR THRU P-ERROR-EXIT.

        ADD 1 TO CTR1.
        GO TO P-QUAL-LOOP.
P-REC-02.
        EXAMINE WSEN-TECH REPLACING LEADING SPACES BY ZEROS.
        EXAMINE WTECH     REPLACING LEADING SPACES BY ZEROS.
        EXAMINE WTECHN    REPLACING LEADING SPACES BY ZEROS.
        EXAMINE WEXEC     REPLACING LEADING SPACES BY ZEROS.
        EXAMINE WCLER     REPLACING LEADING SPACES BY ZEROS.
        EXAMINE WARTSAN   REPLACING LEADING SPACES BY ZEROS.
        EXAMINE WUNSKIL   REPLACING LEADING SPACES BY ZEROS.
        IF WSEN-TECH      NOT NUMERIC OR
           WTECH          NOT NUMERIC OR
           WTECHN         NOT NUMERIC OR
           WEXEC          NOT NUMERIC OR
           WCLER          NOT NUMERIC OR
           WARTSAN        NOT NUMERIC OR
           WUNSKIL        NOT NUMERIC
                MOVE 'NO. OF STAFF ERROR' TO L1-ERROR
                PERFORM P-ERROR THRU P-ERROR-EXIT.

        GO TO P-WRITE-OUT.
P-REC-03.
        IF NOT TYPE-OK MOVE 'TYPE ERROR' TO L1-ERROR
                PERFORM P-ERROR THRU P-ERROR-EXIT.

        MOVE 1 TO CTR1.
P-AMT-LOOP.
        IF CTR1 > 10 GO TO P-WRITE-OUT.
        EXAMINE AMT-1 (CTR1) REPLACING LEADING SPACES BY ZEROS.
        IF AMT-1 (CTR1) NOT NUMERIC MOVE 'AMOUNT ERROR' TO L1-ERROR
                PERFORM P-ERROR THRU P-ERROR-EXIT.

        ADD 1 TO CTR1.
        GO TO P-AMT-LOOP.
P-REC-04.
        IF NOT CODE-OK MOVE 'ITEM CODE ERROR' TO L1-ERROR

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                                PERFORM P-ERROR THRU P-ERROR-EXIT.
EXAMINE RPROVIDED REPLACING LEADING SPACES BY ZEROS.
EXAMINE RUSED      REPLACING LEADING SPACES BY ZEROS.
IF RPROVIDED NOT NUMERIC OR
   RUSED      NOT NUMERIC
   MOVE 'PROVIDED OR USED AMT ERROR' TO LI-ERROR
   PERFORM P-ERROR THRU P-ERROR-EXIT.
GO TO P-WRITE-OUT.
P-REC-05.
  IF BUDG-YR1 = SPACES OR
     BUDG-YR2 = SPACES OR
     BUDG-YR1 NOT NUMERIC OR
     BUDG-YR2 NOT NUMERIC MOVE 'BUDGET YEAR ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
P-CHECK-AMT.
  EXAMINE EXP-1 REPLACING LEADING SPACES BY ZEROS.
  EXAMINE EXP-2 REPLACING LEADING SPACES BY ZEROS.
  IF EXP-1 NOT NUMERIC OR
     EXP-2 NOT NUMERIC MOVE 'EXP. AMOUNT ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
  GO TO P-WRITE-OUT.
P-REC-06.
  MOVE PROGRAMME-NO TO WPROGNO.
  MOVE PROJECT-NO   TO WPROJNO.
P-SEARCH.
  PERFORM P-SEARCH-PRGNO THRU P-PRG-EXIT.
  IF GEN-IND-1 = 0 MOVE 'PRG. NUMBER ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
  PERFORM P-SEARCH-PROJNO THRU P-PROJ-EXIT.
  IF GEN-IND-2 = 0 MOVE 'PROJ. NUMBER ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
  MOVE 0 TO GEN-IND-1 GEN-IND-2.
  GO TO P-WRITE-OUT.
P-REC-07.
  IF NOT TYPE9-OK MOVE 'REC-TYPE92 ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
  IF NATIONALITY = SPACES GO TO P-PERCT.
  EXAMINE NATIONALITY REPLACING LEADING SPACES BY ZEROS.
  IF NOT <-OK MOVE 'NATIONALITY ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
P-PERCT.
  EXAMINE PERCT-1 REPLACING LEADING SPACES BY ZEROS.
  IF PERCT-1 NOT NUMERIC
    MOVE 'PERCENTAGE ERROR' TO LI-ERROR
    PERFORM P-ERROR THRU P-ERROR-EXIT.
  MOVE 1 TO CTRL.
P-REC9-LOOP.
  IF CTRL > 5 GO TO P-CHECK-REFNO.
  IF QUALF (CTRL) = SPACES ADD 1 TO CTRL GO TO P-REC9-LOOP.
  MOVE QUALF (CTRL) TO QUAL-W.
  IF NOT QUALF-OK MOVE 'QUALIFICATION ERROR' TO LI-ERROR
  PERFORM P-ERROR THRU P-ERROR-EXIT.
  ADD 1 TO CTRL.
  GO TO P-REC9-LOOP.
P-CHECK-REFNO.
  MOVE PRG-NO TO WPROGNO.
  MOVE PROJ-NO TO WPROJNO.
  GO TO P-SEARCH.
P-REC-10.
  EXAMINE STAFF-1 REPLACING LEADING SPACES BY ZEROS.
  EXAMINE STAFF-2 REPLACING LEADING SPACES BY ZEROS.
  EXAMINE STAFF-3 REPLACING LEADING SPACES BY ZEROS.
  EXAMINE STAFF-4 REPLACING LEADING SPACES BY ZEROS.
  IF STAFF-1 NOT NUMERIC OR
     STAFF-2 NOT NUMERIC OR
     STAFF-3 NOT NUMERIC OR

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        STAFF-4 NOT NUMERIC
        MOVE 'NO. OF STAFF ERROR' TO L1-ERROR
        PERFORM P-ERROR THRU P-ERROR-EXIT.
    GO TO P-CHECK-REFNO.
P-REC-11.
    EXAMINE PERS-LOCAL    REPLACING LEADING SPACES BY ZEROS.
    EXAMINE PERS-AID      REPLACING LEADING SPACES BY ZEROS.
    EXAMINE OPER-LOCAL    REPLACING LEADING SPACES BY ZEROS.
    EXAMINE OPER-AID      REPLACING LEADING SPACES BY ZEROS.
    IF RECURRENT-1 NOT NUMERIC
        MOVE 'RECURRENT AMOUNT ERROR' TO L1-ERROR
        PERFORM P-ERROR THRU P-ERROR-EXIT.
    GO TO P-CHECK-REFNO.
P-REC-12.
    EXAMINE CAPITAL-1    REPLACING LEADING SPACES BY ZEROS.
    EXAMINE CAPITAL-2    REPLACING LEADING SPACES BY ZEROS.
    EXAMINE CAPITAL-3    REPLACING LEADING SPACES BY ZEROS.
    EXAMINE CAPITAL-4    REPLACING LEADING SPACES BY ZEROS.
    EXAMINE CAPITAL-5    REPLACING LEADING SPACES BY ZEROS.
    IF CAPITAL-1 NOT NUMERIC OR
        CAPITAL-2 NOT NUMERIC OR
        CAPITAL-3 NOT NUMERIC OR
        CAPITAL-4 NOT NUMERIC OR
        CAPITAL-5 NOT NUMERIC
        MOVE 'CAPITAL COST AMOUNT ERROR' TO L1-ERROR
        PERFORM P-ERROR THRU P-ERROR-EXIT.
    GO TO P-CHECK-REFNO.
P-WRITE-OUT.
    IF SW1 = 1 MOVE 0 TO SW1 GO TO P-READ.
    WRITE OUTREC FROM WORKREC-01.
    GO TO P-READ.
P-ERROR.
    PERFORM P-HEAD THRU P-HEAD-EXIT.
    MOVE 1 TO SW1.
    MOVE WINST-CODE TO L1-INST-CODE.
    MOVE WSJRV-YR TO L1-SURV-YR.
    MOVE REC-TYPE TO L1-REC-TYPE.
    IF REC-TYPE = '03' MOVE TYPE32 TO L1-ITEM-CODE.
    IF REC-TYPE = '04' MOVE RITEM-CODE TO L1-ITEM-CODE.
    IF REC-TYPE = '09' MOVE REC-TYPE92 TO L1-ITEM-CODE.
    MOVE PRJG-NO TO L1-PROG.
    MOVE PROJ-NO TO L1-PROJ.
    WRITE LP-REC FROM LINE1 AFTER 2.
    MOVE SPACES TO LINE1.
    SUBTRACT 2 FROM LCT.
P-ERROR-EXIT.
    EXIT.
P-SEARCH-PRJGNO.
    MOVE 0 TO GEN-IND-1.
    MOVE 1 TO CTR.
P-SPRJDG-LP.
    IF CTR > 500 GO TO P-PRJG-EXIT.
    IF WPRJGNO = WTPROG-NO (CTR)
        MOVE 1 TO GEN-IND-1
        GO TO P-PRJG-EXIT.
    ADD 1 TO CTR.
    GO TO P-SPRJDG-LP.
P-PRJG-EXIT.
    EXIT.
P-SEARCH-PRJJNO.
    MOVE 0 TO GEN-IND-2.
    MOVE 1 TO CTR.
P-SPRJG-LP.
    IF CTR > 500 GO TO P-PROJ-EXIT.
    IF WPROJNO = WTPROJ-NO (CTR)
        MOVE 1 TO GEN-IND-2

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                GO TO P-PROJ-EXIT.
        ADD 1 TO CTR.
        GO TO P-SPROJ-LP.
P-PROJ-EXIT.
        EXIT.
P-HEAD.
        IF LCT > 0 GO TO P-HEAD-EXIT.
        ADD 1 TO PAGE-CT.
        MOVE PAGE-CT TO H1PAGE.
        WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
        WRITE LP-REC FROM HEAD2 AFTER 2.
        WRITE LP-REC FROM HEAD3 AFTER 2.
        WRITE LP-REC FROM HEAD4 AFTER 1.
        WRITE LP-REC FROM HEAD5 AFTER 2.
        WRITE LP-REC FROM HEAD6 AFTER 1.
        MOVE 50 TO LCT.
P-HEAD-EXIT.
        EXIT.
P-END.
        CLOSE  DISK-FL TAPEDUT PROG-FILE
              PROJ-FL  PRINT-FL.
        STOP RUN.

/*
// LBLTYP TAPE      .
// EXEC LNKEOT      .
/*
*  ## EJJ

```

(v) PROGRAM RAARP84

(a) Program Description

- 3.24 This is an update program. The master file records are either amended or deleted depending on the amendment action code. New records are inserted in the file in the appropriate sequence.

INPUT - (1) RAARDATA on magnetic tape (see 2.21 through 2.34)

(2) RAARTRAN on disk

OUTPUT - (1) RAARDATA on magnetic tape

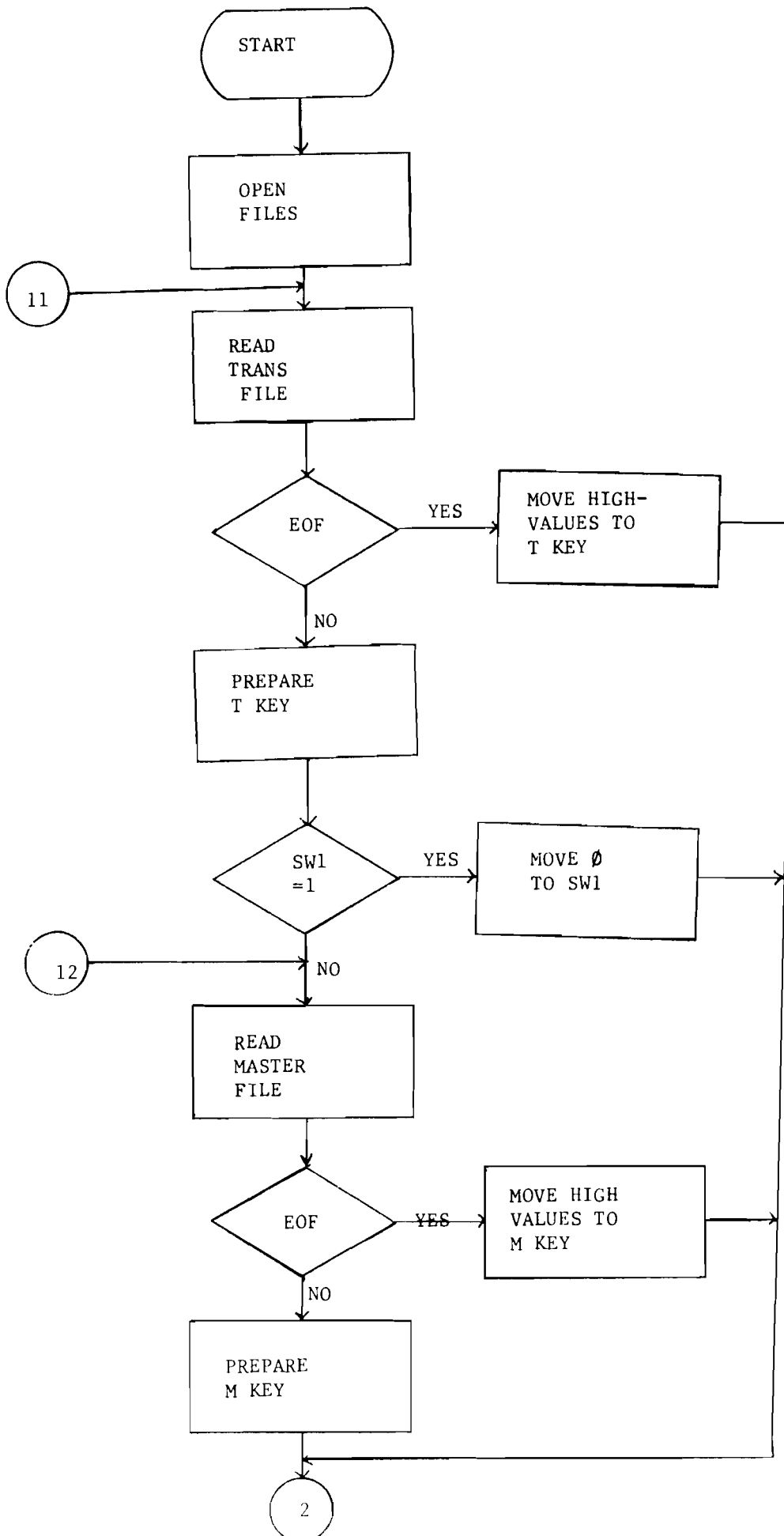
(2) Printout LIST 84 entitled 'UPDATE REPORT'(See Appendices II, III).

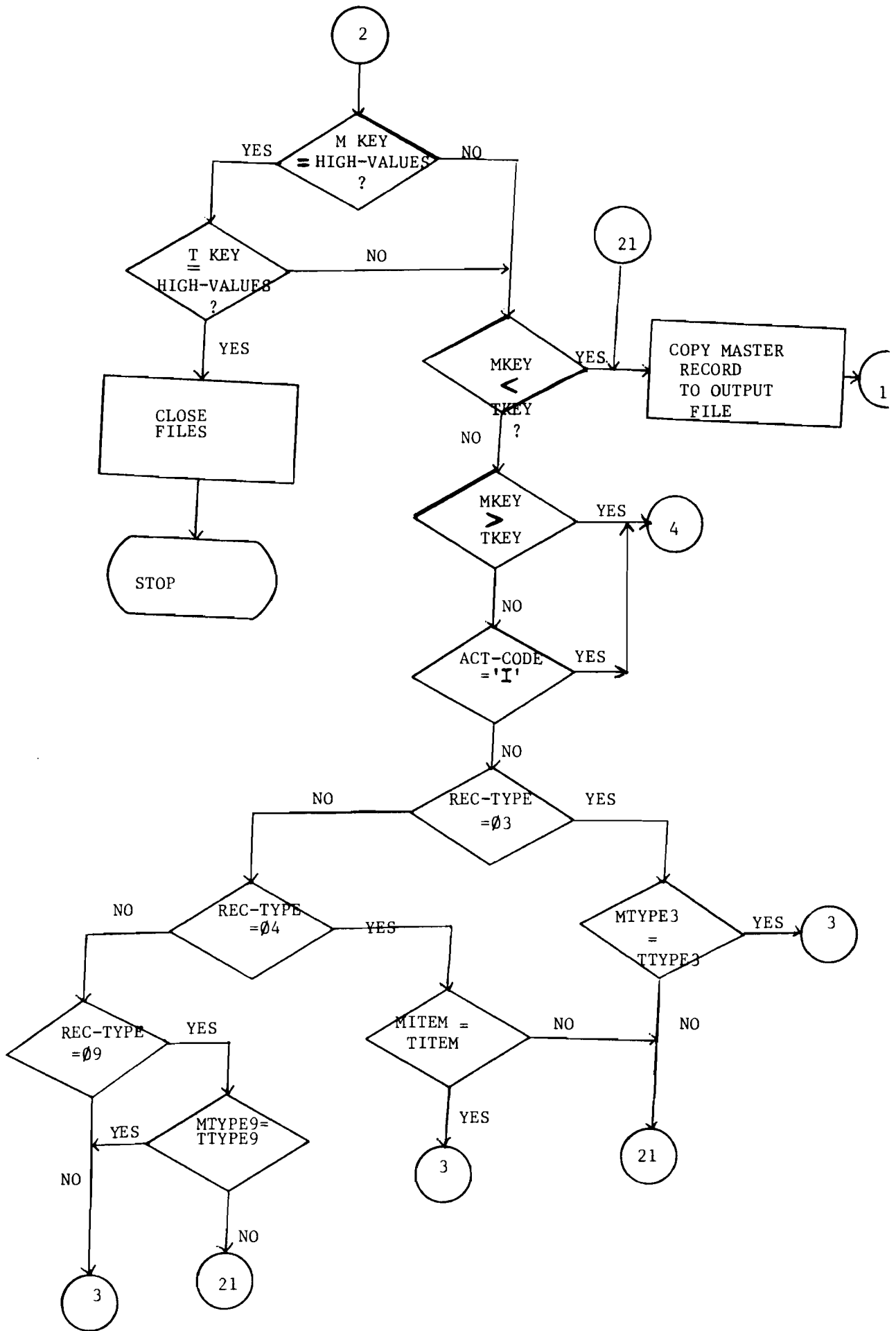
(b) Program Procedure

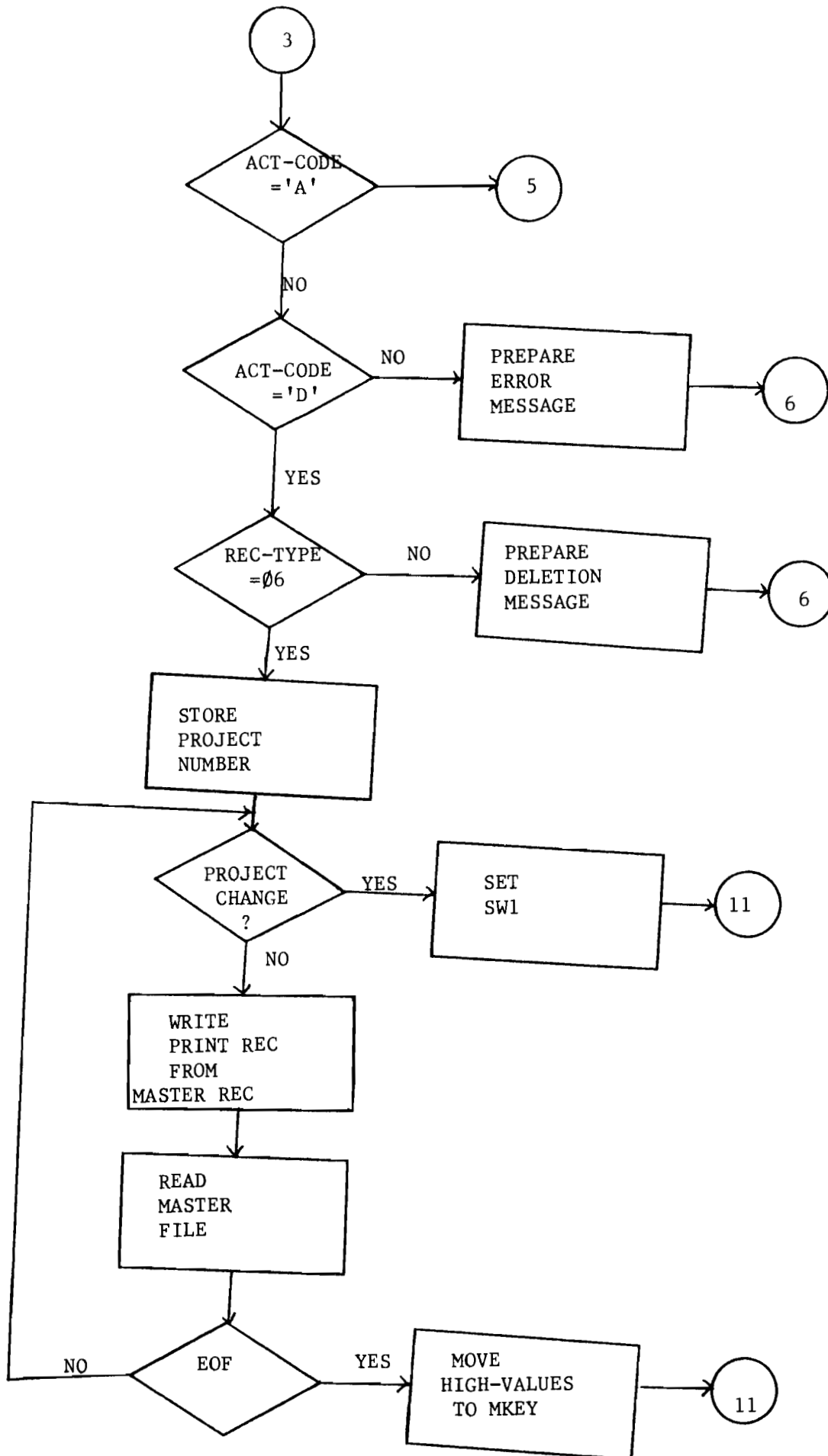
- 3.25 The program first opens both the input and output files, then reads the amendment file, RAARTRAN, and the master file, RAARDATA, respectively. In each case, the keys for comparison are prepared.
- 3.26 If the master key is less than the amendment key, the master file record is copied to the output file and the next master file record is read and comparison is repeated.
- 3.27 If the master key is equal to the amendment key and the action code in the amendment record is a deletion, then a deletion is made and a message together with the main keys printed. The program then goes to read both the files. Further if the action code is an amendment, then amendment record is moved to the output record and written to the output file. An amendment message is printed together with the main keys.
- 3.28 If master key equals the amendment key and the amendment code is an insertion, then a further check is made to ensure that it is not a duplication before the actual insertion is made.
- 3.29 If master key is greater than the amendment key, and the amendment code is an insertion, then the amendment record is moved and written

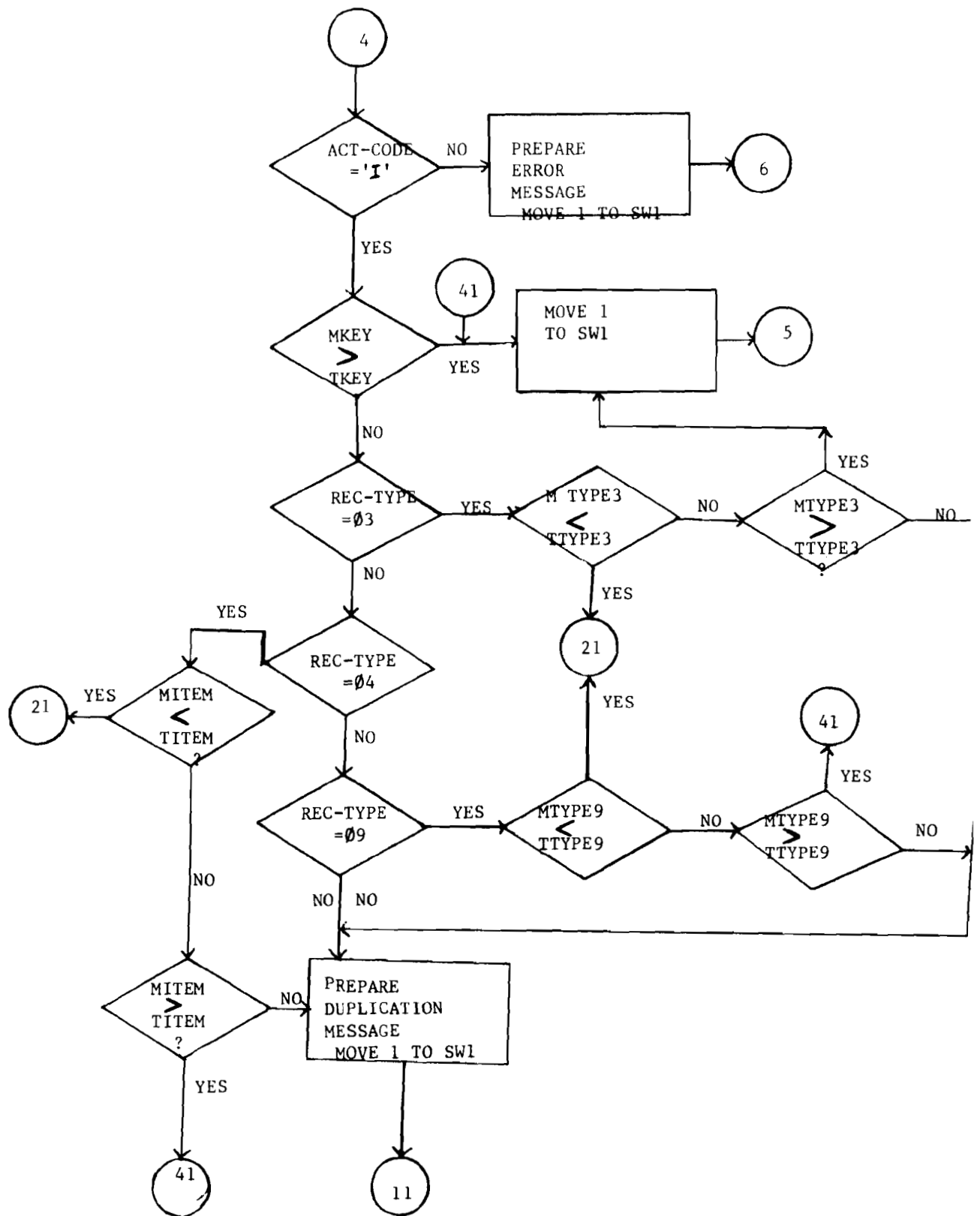
to the output file, otherwise an error message is output to the line printer.

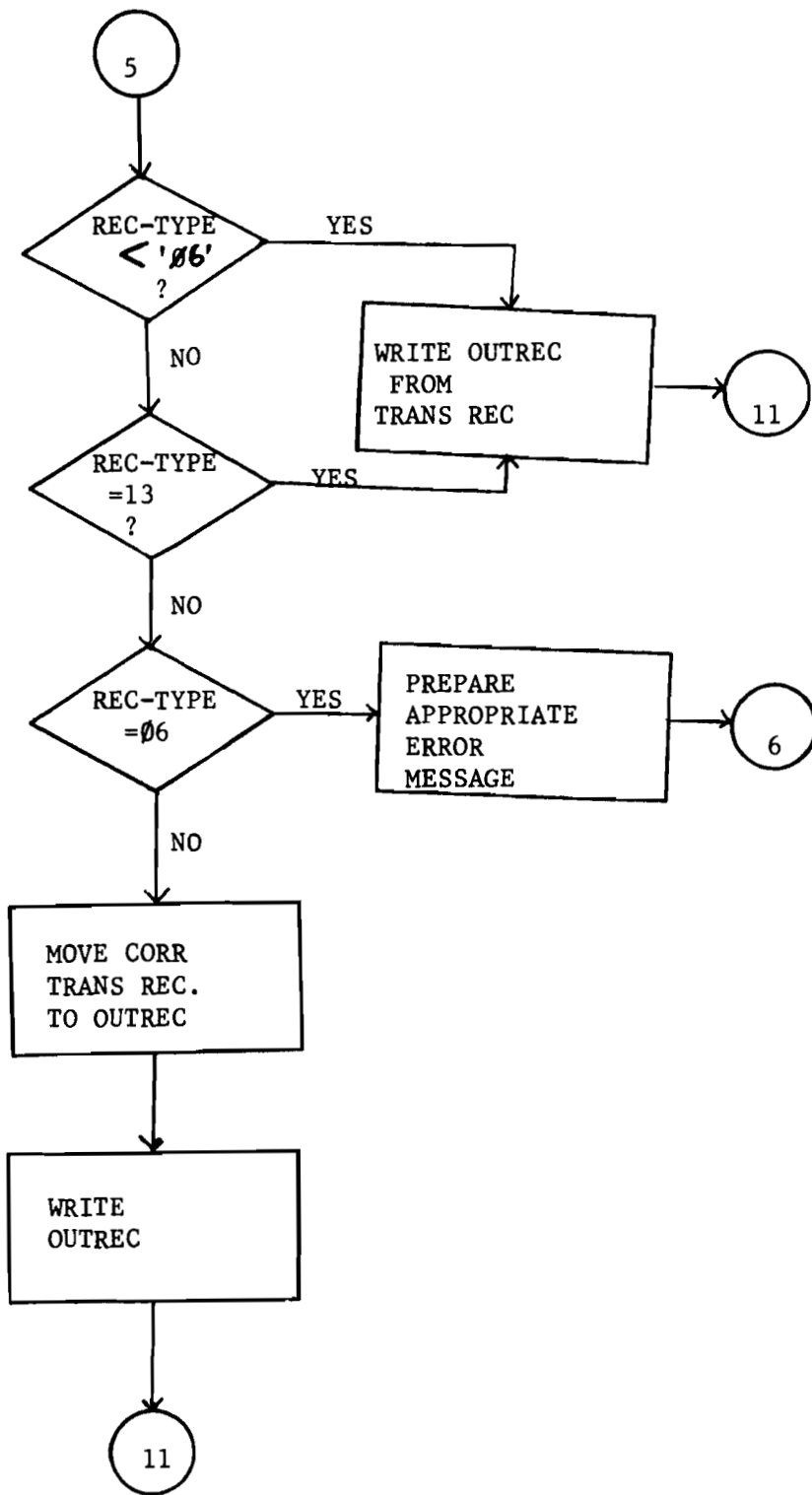
- 3.30 If the amendment key equals the master key, the action code is a deletion, and the amendment record type equals 06 then the program deletes all records, from 06 through 12, of the same project number. Upto 25 print records are printed, double spaced on every new page for the update report.

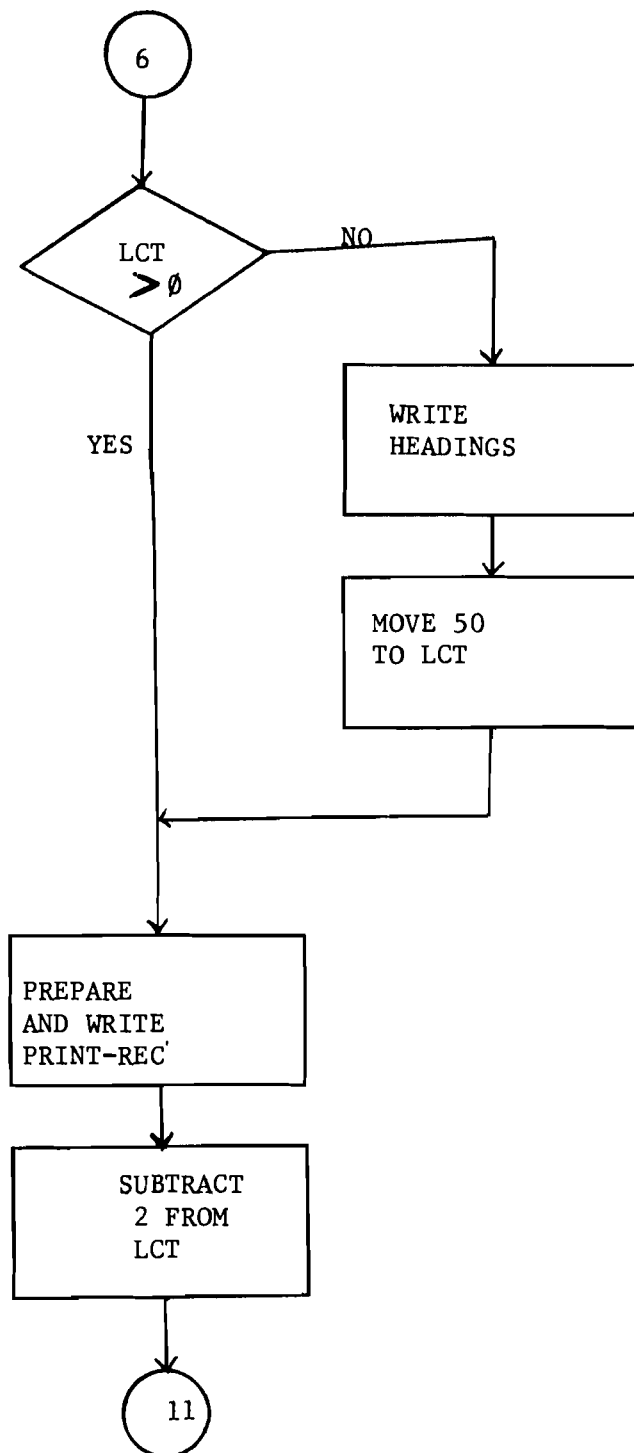












(d) PROGRAM LISTING - RAARP84

```
* IF JOB JNM=RAARP84,CLASS=A,USER=OPSO4000
// JOB RAARP84          UPDATE      PROGRAM
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP84,*
// EXEC FCDBDL,SIZE=64K
CBL NOSEQ,CLIST,SXREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP84.
    AUTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES. CO1 IS NEWPAGE SYSIPT IS CREADER.
    INPUT-OUTPUT SECTION.
    FILE-CONTROL.
      SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S.
      SELECT TRANS-FL ASSIGN TO SYS001-DA-3340-S.
      SELECT MASTER-FL ASSIGN TO SYS002-UT-3420-S.
      SELECT TAPEOUT ASSIGN TO SYS003-JT-3420-S.
  DATA DIVISION.
  FILE SECTION.
    FD PRINT-FL RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORD IS LP-REC.
    OL LP-REC.
      02 FILLER PIC X(133).
  *
    FD TRANS-FL RECORDING MODE IS F
      BLOCK CONTAINS 3400 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS TRANS-REC.
  *
    VALUE OF ID IS 'RAARTRAN'.
    OL TRANS-REC.
      02 FILLER PIC X(128).
    FD MASTER-FL RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS MASTER-REC.
  *
    VALUE OF ID IS 'RAARDATA'.
    OL MASTER-REC.
      02 FILLER PIC X(140).
  *
    FD TAPEOUT RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS OUTREC.
  *
    VALUE OF ID IS 'RAARDATA'.
    OL OUTREC.
      02 FILLER PIC X(140).
  WORKING-STORAGE SECTION.
    77 CTR PIC 999 VALUE 0.
    77 PAGE-CT PIC 999 VALUE 0.
    77 LCT PIC 999 VALUE 0.
    77 SW1 PIC 9 VALUE 0.
    77 GEN-IND-1 PIC 9 VALUE 0.
    77 GEN-IND-2 PIC 9 VALUE 0.
    77 CTR1 PIC 99 VALUE 0.
    77 CTR2 PIC 99 VALUE 0.
    01 STORE-1.
      02 QUAL-W PIC XX.
      88 QUALF-OK VALUE '01' THRU '09'.
      02 SPROJ-NJ PIC X(15).
    01 MKEY.
```

```

02 INST-CJDE PIC X(03).
02 SURV-YEAR PIC XX.
02 WREC-TYPE PIC XX.
02 MPROGNO PIC X(15).
02 MPROJNO PIC X(15).
01 TKEY.
02 T-CODE PIC X(03).
02 T-YEAR PIC XX.
02 TREC-TYPE PIC XX.
02 TPROGNO PIC X(15).
02 TPROJNO PIC X(15).
*
01 MASTER-01.
02 WINST-CODE PIC X(03).
02 WSURV-YR PIC XX.
02 FILLER PIC X.
02 REC-TYPE PIC XX.
02 WDIRECTOR-NM PIC X(15).
02 WQUAL.
03 QUAL-1 PIC XX OCCURS 5.
02 FILLER PIC X(107).
01 MASTER-02 REDEFINES MASTER-01.
02 FILLER PIC X(08).
02 WYEARS.
03 WPHYDYEARS OCCURS 10.
04 WPHYD-1 PIC XX.
03 WMSCYEARS OCCURS 10.
04 WMSC-1 PIC XX.
03 WBSYEARS OCCURS 10.
04 WBS-1 PIC XX.
02 FILLER5.
03 WSEN-TECH PIC XX.
03 WTECH PIC XX.
03 WTECHN PIC XX.
03 WEXEC PIC XX.
03 WCLER PIC XX.
03 WARTSAN PIC XX.
03 WUNSKIL PIC XXX.
02 FILLER PIC X(57).
01 MASTER-03 REDEFINES MASTER-01.
02 FILLER PIC X(08).
02 TYPE32 PIC X.
02 REC-DEV-AMT.
03 AMT-1 PIC X(07) OCCURS 10.
02 FILLER PIC X(61).
01 MASTER-04 REDEFINES MASTER-01.
02 FILLER PIC X(08).
02 RITEM-CODE PIC X(03).
02 FILLER PIC X(09).
02 REXP.
03 RPROVIDED PIC X(07).
03 RUSED PIC X(07).
02 FILLER PIC X(106).
01 MASTER-05 REDEFINES MASTER-01.
02 FILLER PIC X(08).
02 WBUDG.
03 BUDG-YR1 PIC XX.
03 EXP-1 PIC X(07).
03 BUDG-YR2 PIC XX.
03 EXP-2 PIC X(07).
02 FILLER PIC X(114).
01 MASTER-06 REDEFINES MASTER-01.
02 FILLER PIC X(08).
02 PROGRAMME-NO.
03 RREF-NO-1 PIC XXX.
03 RCAT-1 PIC X.

```

```

03 RSUBJ-1      PIC XXX.
03 RFFDR-1      PIC XX.
03 RYEAR-1      PIC XX.
03 RSERIAL-1    PIC X(04).
02 PROJECT-NO.
03 RREF-NO-2    PIC X(03).
03 RCAT-2       PIC X.
03 RSUBJ-2      PIC XXX.
03 RFFDR-2      PIC XX.
03 RYEAR-2      PIC XX.
03 RSERIAL-2    PIC X(04).
02 FILLER       PIC X(102).
*
01 MASTER-09 REDEFINES MASTER-01.
02 FILLER       PIC X(08).
02 REC-TYPE92   PIC X.
02 FILLER       PIC X(17).
02 WREST.
03 QJALF        PIC XX OCCURS 5.
03 RES-EXP      PIC XX.
03 NATIONALITY  PIC XX.
03 PERCT-1      PIC X(03).
02 FILLER       PIC X(57).
02 PROG-NO-W    PIC X(15).
02 PROJ-NO-W    PIC X(15).
02 BATCH-NO     PIC X(03).
02 FILLER       PIC X(07).
01 MASTER-10 REDEFINES MASTER-01.
02 FILLER       PIC X(08).
02 WSTAFF.
03 STAFF-1      PIC XX.
03 FILLER       PIC X(08).
03 STAFF-2      PIC XX.
03 FILLER       PIC X(08).
03 STAFF-3      PIC XX.
03 FILLER       PIC X(08).
03 STAFF-4      PIC XX.
02 FILLER       PIC X(60).
02 PROGNO-10-W  PIC X(15).
02 PROJNO-10-W  PIC X(15).
02 FILLER       PIC X(10).
*
01 MASTER-11 REDEFINES MASTER-01.
02 FILLER       PIC X(08).
02 RECURRENT-1.
03 PERS-LOCAL   PIC X(07).
03 PERS-AID     PIC X(07).
03 OPER-LOCAL   PIC X(07).
03 OPER-AID     PIC X(07).
02 FILLER       PIC X(64).
02 PROGNO-11-W  PIC X(15).
02 PROJNO-11-W  PIC X(15).
02 FILLER       PIC X(10).
01 MASTER-12 REDEFINES MASTER-01.
02 FILLER       PIC X(18).
02 CAPITAL-COST.
03 CAPITAL-1    PIC X(07).
03 FILLER       PIC X(10).
03 CAPITAL-2    PIC X(07).
03 FILLER       PIC X(10).
03 CAPITAL-3    PIC X(07).
03 FILLER       PIC X(10).
03 CAPITAL-4    PIC X(07).
03 FILLER       PIC X(10).
03 CAPITAL-5    PIC X(07).
02 FILLER       PIC X.

```

```

02 RDATE-1          PIC XX.
02 RDATE-2          PIC XX.
02 FILLER           PIC X(02).
02 PROJNO-12-W     PIC X(15).
02 PROJNO-12-W     PIC X(15).
02 FILLER           PIC X(10).
01 MASTER-13 REDEFINES MASTER-01.
02 FILLER           PIC X(08).
02 DESIG-INT       PIC X.
02 QUIZES          PIC X(63).
02 FILLER           PIC X(68).

*
*
01 TRANS-01.
02 TINST-CODE      PIC X(03).
02 TSURV-YR        PIC XX.
02 ACTION-CODE     PIC X.
02 REC-TYPE-T      PIC XX.
02 TDIRECTOR-NM    PIC X(15).
02 TQUAL.
03 QUAL-T         PIC XX OCCURS 5.
02 FILLER          PIC X(095).
01 TRANS-02 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 TYEARS.
03 TPHYDYEARS OCCURS 10.
04 TPHYD-1        PIC XX.
03 TMSCYEARS OCCURS 10.
04 TMSC-1         PIC XX.
03 TBSCYEARS OCCURS 10.
04 TBSC-1         PIC XX.
02 FILLER4.
03 TSEN-TECH      PIC XX.
03 TTECH          PIC XX.
03 TTECHN         PIC XX.
03 TEXEC          PIC XX.
03 TCLER          PIC XX.
03 TARTSAN        PIC XX.
03 TUNSKIL        PIC XXX.
02 FILLER          PIC X(45).
01 TRANS-03 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 TYPE32-T       PIC X.
02 REC-DEV-AMT-T.
03 AMT-T          PIC X(07) OCCURS 10.
02 FILLER          PIC X(49).
01 TRANS-04 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 TITEM-CODE     PIC X(03).
02 FILLER          PIC X(09).
02 TEXP.
03 TPROVIDED      PIC X(07).
03 TUSED          PIC X(07).
02 FILLER          PIC X(094).
01 TRANS-05 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 TBUDG.
03 TBUDG-YR1      PIC XX.
03 TEXP-1         PIC X(07).
03 TBUDG-YR2      PIC XX.
03 TEXP-2         PIC X(07).
02 FILLER          PIC X(102).
01 TRANS-06 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 PROGRAMME-NO-T.
03 TREF-NO-1      PIC XXX.

```

```

03 TCAT-1          PIC X.
03 TSUBJ-1         PIC XXX.
03 TFFDR-1         PIC XX.
03 TYEAR-1         PIC XX.
03 TSERIAL-1       PIC X(04).
02 PROJECT-NO-T.
03 TREF-NO-2       PIC X(03).
03 TCAT-2          PIC X.
03 TSUBJ-2         PIC XXX.
03 TFFDR-2         PIC XX.
03 TYEAR-2         PIC XX.
03 TSERIAL-2       PIC X(04).
02 FILLER          PIC X(90).
*
01 TRANS-09 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 REC-TYPE92-T    PIC X.
02 FILLER          PIC X(17).
02 TREST.
03 QUALF-T         PIC XX OCCURS 5.
03 RES-EXP-T       PIC XX.
03 NATIONAL-T      PIC XX.
03 PERCT-T         PIC X(03).
02 FILLER          PIC X(55).
02 PROG-NO-9-T     PIC X(15).
02 PROJ-NO-9-T     PIC X(15).
01 TRANS-10 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 TSTAFF.
03 STAFF-1-T       PIC XX.
03 FILLER          PIC X(08).
03 STAFF-2-T       PIC XX.
03 FILLER          PIC X(08).
03 STAFF-3-T       PIC XX.
03 FILLER          PIC X(08).
03 STAFF-4-T       PIC XX.
02 FILLER          PIC X(58).
02 PROGNO-10-T     PIC X(15).
02 PROJNO-10-T     PIC X(15).
*
01 TRANS-11 REDEFINES TRANS-01.
02 FILLER          PIC X(08).
02 RECURRENT-T.
03 TPERS-LOCAL     PIC X(07).
03 TPERS-AID       PIC X(07).
03 TOPER-LOCAL     PIC X(07).
03 TOPER-AID       PIC X(07).
02 FILLER          PIC X(62).
02 PROGNO-11-T     PIC X(15).
02 PROJNO-11-T     PIC X(15).
01 TRANS-12 REDEFINES TRANS-01.
02 FILLER          PIC X(18).
02 TCAPITAL-COST.
03 TCAPITAL-1      PIC X(07).
03 FILLER          PIC X(10).
03 TCAPITAL-2      PIC X(07).
03 FILLER          PIC X(10).
03 TCAPITAL-3      PIC X(07).
03 FILLER          PIC X(10).
03 TCAPITAL-4      PIC X(07).
03 FILLER          PIC X(10).
03 TCAPITAL-5      PIC X(07).
02 FILLER          PIC X.
02 TDATE-1         PIC XX.
02 TDATE-2         PIC XX.
02 PROGNO-12-T     PIC X(15).

```



```

02 PROJNO-12-T          PIC X(15).
01 TRANS-13 REDEFINES TRANS-01.
02 FILLER                PIC X(08).
02 TDESIG-INT            PIC X.
02 TQUIZES               PIC X(63).
02 FILLER                PIC X(56).
*
01 LINE1.
02 FILLER                PIC X(13).
02 LI-INST-CODE          PIC XXX.
02 FILLER                PIC X(11).
02 LI-SJRV-YR            PIC XX.
02 FILLER                PIC X(15).
02 LI-REC-TYPE           PIC XX.
02 LI-ITEM-CODE          PIC X(03).
02 FILLER                PIC X(11).
02 LI-PROG               PIC X(15).
02 FILLER                PIC X(04).
02 LI-PROJ               PIC X(15).
02 FILLER                PIC X(04).
02 LI-ERROR              PIC X(35).
01 HEAD1.
02 FILLER                PIC X(03) VALUE SPACES.
02 HDATE                 PIC X(08) VALUE SPACES.
02 FILLER                PIC X(14) VALUE SPACES.
02 FILLER                PIC X(55) VALUE
'N A T I O N A L C O U N C I L F O R S C I E N C E'.
02 FILLER                PIC X(30) VALUE
' A N D T E C H N O L O G Y '.
02 FILLER                PIC X(11) VALUE SPACES.
02 FILLER                PIC X(05) VALUE 'PAGE:'.
02 H1PAGE                PIC ZZ9.
02 FILLER                PIC X(04) VALUE SPACES.
01 HEAD2.
02 FILLER                PIC X(55) VALUE SPACES.
02 FILLER                PIC X(45) VALUE
'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER                PIC X(33) VALUE SPACES.
01 HEAD3.
02 FILLER                PIC X(20) VALUE SPACES.
02 FILLER                PIC X(12) VALUE 'L I S T      84'.
02 FILLER                PIC X(23) VALUE SPACES.
02 FILLER                PIC X(25) VALUE
'U P D A T E R E P O R T'.
02 FILLER                PIC X(53) VALUE SPACES.
01 HEAD4.
02 FILLER                PIC X(55) VALUE SPACES.
02 FILLER                PIC X(25) VALUE ALL '-'.
02 FILLER                PIC X(53) VALUE SPACES.
01 HEAD5.
02 FILLER                PIC X(10) VALUE SPACES.
02 FILLER                PIC X(10) VALUE 'INST. CODE'.
02 FILLER                PIC X(04) VALUE SPACES.
02 FILLER                PIC X(10) VALUE 'SURV. YEAR'.
02 FILLER                PIC X(04) VALUE SPACES.
02 FILLER                PIC X(18) VALUE 'REC-TYPE/ITEM-CODE'.
02 FILLER                PIC X(04) VALUE SPACES.
02 FILLER                PIC X(16) VALUE 'PROGRAMME NUMBER'.
02 FILLER                PIC X(04) VALUE SPACES.
02 FILLER                PIC X(15) VALUE 'PROJECT NUMBER'.
02 FILLER                PIC X(04) VALUE SPACES.
02 FILLER                PIC X(27) VALUE
'U P D A T E M E S S A G E'.
02 FILLER                PIC X(07) VALUE SPACES.
01 HEAD6.
02 FILLER                PIC X(10) VALUE SPACES.

```

```

02 FILLER      PIC X(10) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(10) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(18) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(16) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(15) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(27) VALUE ALL '-'.
02 FILLER      PIC X(07) VALUE SPACES.

```

PROCEDURE DIVISION.

P-START.

```

OPEN INPUT TRANS-FL MASTER-FL
      OUTPUT TAPEOUT PRINT-FL.
MOVE CURRENT-DATE TO HDATE.
MOVE SPACES TO LINE1.

```

P-READ-TRANS.

```

READ TRANS-FL INTO TRANS-D1 AT END
      MOVE HIGH-VALUES TO TKEY GO TO P-COMPARE.
MOVE TINST-CODE TO T-CODE.
MOVE TSURV-YR TO T-YEAR.
MOVE REC-TYPE-T TO TREC-TYPE.
MOVE PRDG-NJ-9-T TO TPROGNO.
MOVE PROJ-NJ-9-T TO TPROJNO.
IF SW1 = 1 MOVE 0 TO SW1 GO TO P-COMPARE.

```

P-READ-MASTER.

```

READ MASTER-FL INTO MASTER-D1 AT END
      MOVE HIGH-VALUES TO MKEY GO TO P-COMPARE.
MOVE WINST-CODE TO INST-CODE.
MOVE MSURV-YR TO SURV-YEAR.
MOVE REC-TYPE TO WREC-TYPE.
MOVE PRDG-NJ-W TO MPROGNO.
MOVE PROJ-NJ-W TO MPROJNO.

```

P-COMPARE.

```

IF MKEY < TKEY GO TO P-COPY.
IF MKEY > TKEY GO TO P-INSERTION.
IF (MKEY = HIGH-VALUES) AND
   (TKEY = HIGH-VALUES) GO TO P-END.
IF ACTION-CODE = 'I' GO TO P-INSERTION.
IF REC-TYPE = '09' GO TO P-CHECK-09.
IF REC-TYPE = '03' GO TO P-CHECK-03.
IF REC-TYPE = '04' GO TO P-CHECK-04.
GO TO P-EQUAL-LEG.

```

*

P-CHECK-03.

```

IF TYPE32 = TYPE32-T GO TO P-EQUAL-LEG.
GO TO P-COPY.

```

P-CHECK-04.

```

IF RITEM-CODE = TITEM-CODE GO TO P-EQUAL-LEG.
GO TO P-COPY.

```

P-CHECK-09.

```

IF REC-TYPE92 = REC-TYPE92-T GO TO P-EQUAL-LEG.
GO TO P-COPY.

```

P-EQUAL-LEG.

```

IF ACTION-CODE = 'D' GO TO P-DELETION.
IF ACTION-CODE = 'A' GO TO P-AMENDMENT.
MOVE 'WRONG AMENDMENT CODE' TO L1-ERROR.
GO TO P-PRINT.

```

P-DELETION.

```

IF REC-TYPE = '06' GO TO P-DEL-REST.
MOVE 'DELETED FROM MASTER' TO L1-ERROR.
GO TO P-PRINT.

```

P-DEL-REST.

```

MOVE 'DELETED FROM MASTER' TO L1-ERROR.

```

```

    PERFORM P-PRINT.
    MOVE PROJ-NO-W TO SPROJ-NO.
P-RO-LOOP.
    READ MASTER-FL INTO MASTER-01 AT END
    MOVE HIGH-VALUES TO MKEY GO TO P-READ-TRANS.
    IF PROJ-NO-W NOT = SPROJ-NO GO TO P-END-LOOP.
    MOVE 'DELETED FROM MASTER' TO LI-ERROR.
    MOVE WINST-CODE TO LI-INST-CODE.
    MOVE WSJRV-YR TO LI-SURV-YR.
    MOVE REC-TYPE TO LI-REC-TYPE.
    IF REC-TYPE = '03' MOVE TYPE32 TO LI-ITEM-CODE.
    IF REC-TYPE = '04' MOVE RITEM-CODE TO LI-ITEM-CODE.
    IF REC-TYPE = '09' MOVE REC-TYPE92 TO LI-ITEM-CODE.
    MOVE PROG-NO-W TO LI-PROG.
    MOVE PROJ-NO-W TO LI-PROJ.
    WRITE LP-REC FROM LINE1 AFTER 1.
    SUBTRACT 1 FROM LCT.
    MOVE SPACES TO LINE1.
    GO TO P-RO-LOOP.
P-END-LOOP.
    MOVE 1 TO SW1.
    GO TO P-READ-TRANS.
P-AMENDMENT.
    IF REC-TYPE < '06' OR
       REC-TYPE = '13' GO TO P-COPY-TRANS.
    IF REC-TYPE = '06' GO TO P-REC-06.
    IF REC-TYPE = '09' GO TO P-REC-09.
    IF REC-TYPE = '10' GO TO P-REC-10.
    IF REC-TYPE = '11' GO TO P-REC-11.
    IF REC-TYPE = '12' GO TO P-REC-12.
    MOVE 'RECORD TYPE ERROR' TO LI-ERROR.
    GO TO P-PRINT.
P-COPY-TRANS.
*   MOVE SPACES TO ACTION-CODE.
    MOVE TRANS-01 TO OUTREC.
    WRITE OUTREC.
    GO TO P-MESSAGE.
P-REC-06.
    MOVE 'ILLEGAL AMENDMENT' TO LI-ERROR.
    GO TO P-PRINT.
P-REC-09.
    MOVE TREST TO WREST.
    MOVE PROG-NO-9-T TO PROG-NO-W.
    MOVE PROJ-NO-9-T TO PROJ-NO-W.
    WRITE OUTREC FROM MASTER-09.
    GO TO P-MESSAGE.
P-REC-10.
    MOVE TSTAFF TO WSTAFF.
    MOVE PROGNO-10-T TO PROGNO-10-W.
    MOVE PROJNO-10-T TO PROJNO-10-W.
    WRITE OUTREC FROM MASTER-10.
    GO TO P-MESSAGE.
P-REC-11.
    MOVE RECURRENT-T TO RECURRENT-1.
    MOVE PROGNO-11-T TO PROGNO-11-W.
    MOVE PROJNO-11-T TO PROJNO-11-W.
    WRITE OUTREC FROM MASTER-11.
    GO TO P-MESSAGE.
P-REC-12.
    MOVE TCAPITAL-COST TO CAPITAL-COST.
    MOVE TDATE-1 TO RDATE-1.
    MOVE TDATE-2 TO RDATE-2.
    MOVE PROGNO-12-T TO PROGNO-12-W.
    MOVE PROJNO-12-T TO PROJNO-12-W.
    WRITE OUTREC FROM MASTER-12.
    GO TO P-MESSAGE.

```

```

*
P-MESSAGE.
  IF ACTION-CODE = 'I' MOVE 'INSERTED' TO L1-ERROR
  ELSE
    MOVE 'AMENDED' TO L1-ERROR.
  GO TO P-PRINT.
P-INSERTION.
  IF ACTION-CODE NOT = 'I'
    MOVE 'WRONG INSERTION RECORD' TO L1-ERROR
    MOVE 1 TO SW1
    GO TO P-PRINT.
  IF MKEY > TKEY MOVE 1 TO SW1 GO TO P-AMENDMENT.
  IF REC-TYPE-T = '03' GO TO P-INSERT-03.
  IF REC-TYPE-T = '04' GO TO P-INSERT-04.
  IF REC-TYPE-T = '09' GO TO P-INSERT-09.
P-DJP.
  MOVE 'DUPLICATION ERROR' TO L1-ERROR.
  MOVE 1 TO SW1.
  GO TO P-PRINT.
P-INSERT-03.
  IF TYPE32 < TYPE32-T GO TO P-COPY.
  IF TYPE32 > TYPE32-T MOVE 1 TO SW1 GO TO P-COPY-TRANS.
  GO TO P-DJP.
P-INSERT-04.
  IF RITEM-CODE < TITEM-CODE GO TO P-COPY.
  IF RITEM-CODE > TITEM-CODE MOVE 1 TO SW1 GO TO P-COPY-TRANS.
  GO TO P-DJP.
P-INSERT-09.
  IF REC-TYPE92 < REC-TYPE92-T GO TO P-COPY.
  IF REC-TYPE92 > REC-TYPE92-T MOVE 1 TO SW1 GO TO P-REC-09.
  GO TO P-DJP.
P-COPY.
  WRITE OUTREC FROM MASTER-01.
  GO TO P-READ-MASTER.
P-PRINT.
  PERFORM P-HEAD THRU P-HEAD-EXIT.
  MOVE TINST-CODE TO L1-INST-CODE.
  MOVE TSURV-YR TO L1-SURV-YR.
  MOVE REC-TYPE-T TO L1-REC-TYPE.
  IF REC-TYPE-T = '03' MOVE TYPE32-T TO L1-ITEM-CODE.
  IF REC-TYPE-T = '04' MOVE TITEM-CODE TO L1-ITEM-CODE.
  IF REC-TYPE-T = '09' MOVE REC-TYPE92-T TO L1-ITEM-CODE.
  IF REC-TYPE-T < '06' OR
    REC-TYPE-T = '13' MOVE SPACES TO L1-PRG L1-PROJ.
  IF REC-TYPE-T = '06'
    MOVE PROGRAMME-NO-T TO L1-PRG
    MOVE PROJECT-NO-T TO L1-PROJ
  ELSE
    MOVE PRG-NO-9-T TO L1-PRG
    MOVE PROJ-NO-9-T TO L1-PROJ.
  WRITE LP-REC FROM LINE1 AFTER 2.
  SUBTRACT 2 FROM LCT.
  MOVE SPACES TO LINE1.
P-RO.
  GO TO P-READ-TRANS.
P-HEAD.
  IF LCT > 0 GO TO P-HEAD-EXIT.
  ADD 1 TO PAGE-CT.
  MOVE PAGE-CT TO H1PAGE.
  WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
  WRITE LP-REC FROM HEAD2 AFTER 2.
  WRITE LP-REC FROM HEAD3 AFTER 2.
  WRITE LP-REC FROM HEAD4 AFTER 1.
  WRITE LP-REC FROM HEAD5 AFTER 2.
  WRITE LP-REC FROM HEAD6 AFTER 1.
  MOVE 50 TO LCT.

```

```

      P-HEAD-EXIT.
      EXIT.
*
      P-END.
      CLOSE TRANS-FL  MASTER-FL
      TAPEOUT  PRINT-FL.
      STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/*
/&
*  ## EDJ

```

(vi) PROGRAM RAARP90

(a) Program Description

3.31 This program reads both the project dictionary and the program dictionary files from floppy diskettes and transfers their code numbers and descriptions to disk. The program also produces unsorted listings of these files, in the same sequence as the original keying on diskettes.

3.32 Input - Project dictionary and program dictionary files on floppy diskettes. The keying record length is 80 characters and the files are read as card files, labeled RAARPROJ and RAARPROG respectively (see 2.38, 2.39)

- Parameter card - gives file and heading information

Output - 1) Printout: LIST 90A or LIST 90B entitled PROGRAM DICTIONARY FILE LISTING (UNSORTED) or PROJECT DICTIONARY FILE LISTING (UNSORTED) respectively (see Appendices II, III)

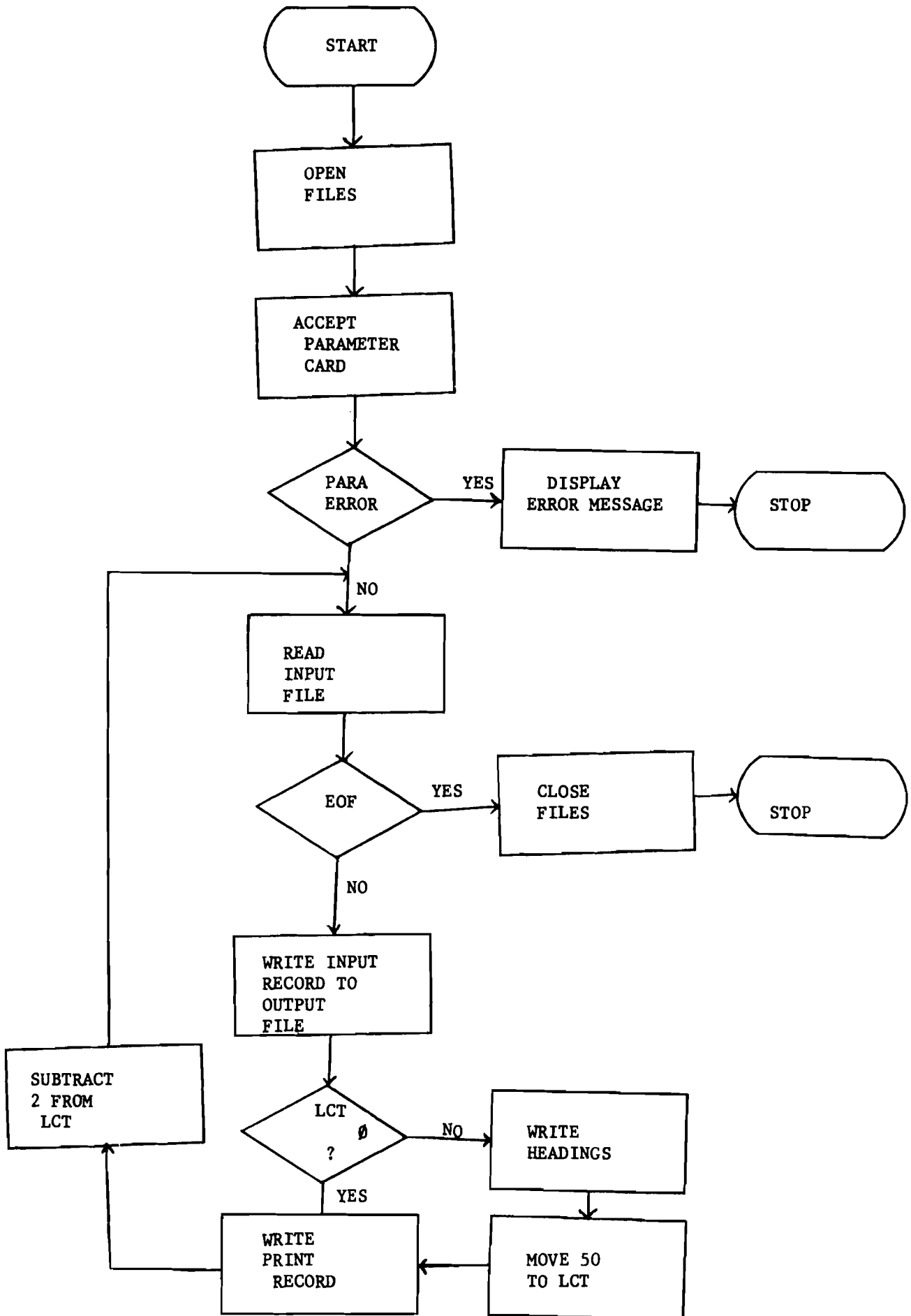
(2) Magnetic Disk file containing the same data as was read from the Input Project file except that the records are in a block size of 8000 characters, labeled RAARPROJ-DATA and RAARPROG-DATA respectively. The disk file is a temporary file which becomes the input to the sort program in the next job step. The output from the sort program is on a magnetic tape labeled RAARPROJ-ST02 and RAARPROG-ST03 respectively.

(b) Program Procedure

3.33 The program opens both the input and output files. Then it proceeds with reading of the input diskette file. No validation is performed. The data is therefore written away on to the output disk file and at the same time output on the printer. The following are the appropriate program flowchart and listing.

(c)

PROGRAM FLOWCHART- RAARP 90



(d) PROGRAM LISTING - RAARP90

```
* ## JOB JNM=RAARP90,CLASS=A,USER=DPS04000
// JOB RAARP90
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP90,*
// EXEC FCOBJL,SIZE=64K
CBL NOSEQ,CLIST, SXREF, FLOW=30, STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP90.
    AUTHOR. CKC, ANK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES. CO1 IS NEWPAGE
                  SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT OUT-FL ASSIGN TO SYS001-DA-3340-S.
    SELECT RAARINPT ASSIGN TO SYS025-UR-2501-S.
    SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S.
  DATA DIVISION.
  FILE SECTION.
    FD OUT-FL RECORDING MODE IS F
      BLOCK CONTAINS 8000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS OUTREC.
    * VALUE OF ID IS 'RAARPROJ-DATA','RAARPROG-DATA'.
    01 OUTREC.
      02 FILLER PIC X(80).
    FD RAARINPT RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORDS IS INPT-REC.
    * VALUE OF ID IS 'RAARPROJ' OR 'RAARPROG'.
    01 INPT-REC.
      02 INPT-NO PIC 9(15).
      02 FILLER PIC X.
      02 INPT-NAME PIC X(64).
    *
    *
    FD PRINT-FL RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORDS IS LP-REC.
    01 LP-REC.
      02 FILLER PIC X(133).
  WORKING-STORAGE SECTION.
    77 SW1 PIC 9 VALUE 0.
    77 LCT PIC 999 VALUE 0.
    77 PAGECT PIC 999 VALUE 0.
    77 CTR1 PIC 999 VALUE 0.
    77 CTR2 PIC 999 VALUE 0.
    01 PARA-CARD.
      02 P-NO PIC X.
      02 P-HEADING PIC X(60).
      02 FILLER PIC X(19).
    *
    01 HEAD1.
      02 FILLER PIC X(03) VALUE SPACES.
      02 H1DATE PIC X(08).
      02 FILLER PIC X(14) VALUE SPACES.
      02 FILLER PIC X(55) VALUE
        'N A T I O N A L C O U N C I L F O R S C I E N C E'.
      02 FILLER PIC X(30) VALUE
        ' A N D T E C H N O L O G Y'.
      02 FILLER PIC X(11) VALUE SPACES.
```



```

02 FILLER      PIC X(05) VALUE    'PAGE:'.
02 H1PAGE      PIC ZZ9.
02 FILLER      PIC X(04) VALUE    SPACES.
*
01 HEAD2.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(44)  VALUE
    'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER      PIC X(44)  VALUE SPACES.
*
01 HEAD3.
02 FILLER      PIC X(03)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE    'LIST '.

02 H3REPORT    PIC XXX VALUE  SPACES.
02 FILLER      PIC X(34)  VALUE SPACES.
02 H3HEAD      PIC X(60)  VALUE  SPACES.
02 H3YEAR      PIC X(07)  VALUE  SPACES.
02 FILLER      PIC X(21)  VALUE SPACES.
*
01 HEAD4.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(60)  VALUE ALL '-'.
02 FILLER      PIC X(28)  VALUE SPACES.
*
01 HEAD5.
02 FILLER      PIC X(31)  VALUE SPACES.
02 H5HEAD      PIC X(15)  VALUE    'N U M B E R    '.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(41)  VALUE
    'D E S C R I P T I O N'.
02 FILLER      PIC X(41)  VALUE  SPACES.
*
01 HEAD6.
02 FILLER      PIC X(31)  VALUE SPACES.
02 FILLER      PIC X(15)  VALUE ALL '-'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(41)  VALUE ALL '-'.
02 FILLER      PIC X(41)  VALUE SPACES.
*
01 LINE1.
02 FILLER      PIC X(31).
02 L1-INPT-NO  PIC X(15).
02 FILLER      PIC X(05).
02 L1PNAME     PIC X(64).
02 FILLER      PIC X(18).
*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT RAARINPT
*
        OUTPUT    OUT-FL PRINT-FL.
        MOVE CURRENT-DATE TO H1DATE.
        MOVE SPACES TO LINE1.
        ACCEPT PARA-CARD FROM CREADER.
        IF P-NO NOT NUMERIC OR
            P-HEADING = SPACES
            DISPLAY 'PARA ERROR - RUN ABANDONED'
            STOP RUN.
        IF P-NO = '1' MOVE '90A' TO H3REPORT.
        IF P-NO = '2' MOVE '90B' TO H3REPORT.
        MOVE P-HEADING TO H3HEAD.
P-READ-1.
    READ RAARINPT AT END GO TO P-CLOSE-2.
    PERFORM P-HEAD THRU P-HEAD-EXIT.
    PERFORM P-PRINT THRU P-PRINT-EXIT.

```

```

        PERFORM P-WRITE THRU P-WRITE-EXIT.
        GO TO P-READ-1.
*
P-PRINT.
    MOVE INPT-NO TO L1-INPT-NO.
    MOVE INPT-NAME TO L1PNAME.
    WRITE LP-REC FROM LINE1 AFTER 2.
    SUBTRACT 2 FROM LCT.
    MOVE SPACES TO LINE1.
P-PRINT-EXIT.
    EXIT.
*
P-WRITE.
    MOVE INPT-REC TO OUTREC.
    WRITE OUTREC INVALID KEY DISPLAY 'INVALID KEY' STOP RJN.
P-WRITE-EXIT.
    EXIT.
*
P-HEAD.
    IF LCT > 0 GO TO P-HEAD-EXIT.
    ADD 1 TO PAGECT.
    MOVE PAGECT TO H1PAGE.
    WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
    WRITE LP-REC FROM HEAD2 AFTER 2.
    WRITE LP-REC FROM HEAD3 AFTER 2.
    WRITE LP-REC FROM HEAD4 AFTER 1.
P-HD.
    WRITE LP-REC FROM HEAD5 AFTER 2.
    WRITE LP-REC FROM HEAD6 AFTER 1.
    MOVE 50 TO LCT.
P-HEAD-EXIT.
    EXIT.
*
P-CLOSE-2.
    CLOSE RAARINPT
           OUT-FL
           PRINT-FL.
    STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/*
* $E EDJ

```

(vii) PROGRAM RAARP 91

(a) Program Description

3.34 This program produces a listing of both the project dictionary and the programme dictionary files. These files are previously sorted on project/programme numbers

3.35 Input:- Magnetic tape containing either the sorted project or program files, labelled RAARPROJ-STØ2 or RAARPROG-STØ3 respectively (see 2.38, 2.39)

Block size is 100 records of 80 characters each.

- Parameter card - supplies information on file and heading.

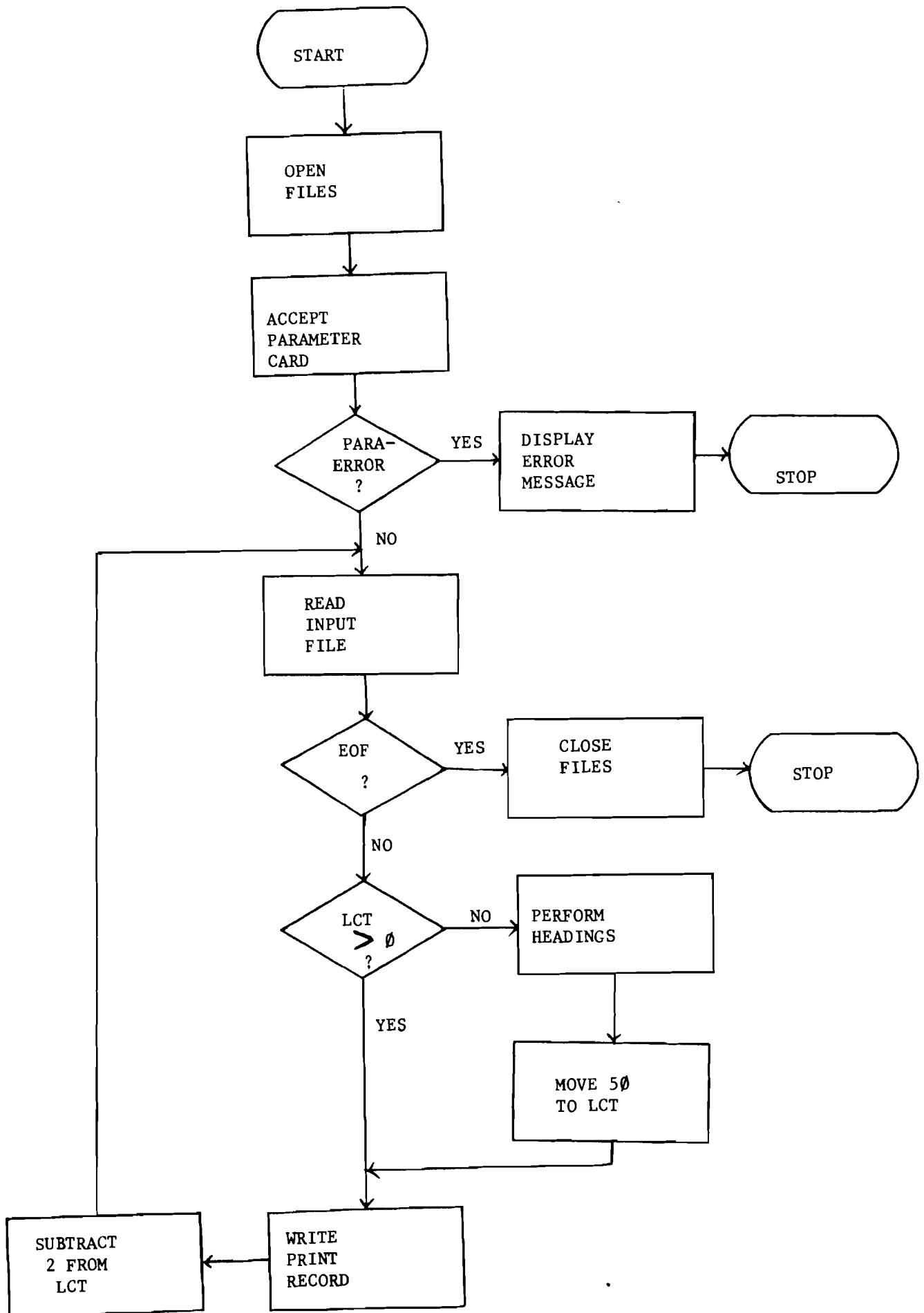
Output - Printout - LIST 91A or LIST 91B entitled 'LISTING OF PROJECT DICTIONARY FILE' or 'LISTING OF PROGRAMME DICTIONARY FILE' respectively, depending on the input file and parameter card used (see Appendices II, III)

(b) Program Procedure

3.36 The program reads a parameter card and then opens both the input and the output files.

It then proceeds to read the input file, process and print the output file. For program flowchart and listing see the ensuing pages.

(c) PROGRAM FLOWCHART - RAARP91



(d) PROGRAM LISTING - RAARP91

```

* ** JOB JNM=RAARP91,CLASS=A,USER=OPS04000
// JOB RAARP91
// LIBDEF CL,TO=USRCL2
// OPTION CATAL
PHASE RAARP91,*
// EXEC FCOBOL,SIZE=64K
CBL NJSEQ,CLIST, SXREF, FLOW=30, STATE
  IDENTIFICATION DIVISION.
  PROGRAM-ID. RAARP91.
  AUTHOR. CKC, AWK, AMK, NKM.
  ENVIRONMENT DIVISION.
  CONFIGURATION SECTION.
  SOURCE-COMPUTER. IBM-370.
  OBJECT-COMPUTER. IBM-370.
  SPECIAL-NAMES. CO1 IS NEWPAGE
                  SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT INPT-FL ASSIGN TO SYS001-JT-3420-S.
    SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.
  DATA DIVISION.
  FILE SECTION.
  FD INPT-FL RECORDING MODE IS F
    BLOCK CONTAINS 8000 CHARACTERS
    LABEL RECORDS ARE STANDARD
    DATA RECORD IS INPT-REC.
*   VALUE OF ID IS 'RAARPROJ-DATA' OR 'RAARPROG'.
  01 INPT-REC.
    02 INPT-NO PIC 9(15).
    02 FILLER PIC X.
    02 INPT-NAME PIC X(64).
*
*
  FD PRINT-FL RECORDING MODE IS F
    LABEL RECORDS ARE OMITTED
    DATA RECORDS IS LP-REC.
  01 LP-REC.
    02 FILLER PIC X(133).
  WORKING-STORAGE SECTION.
  77 SW1 PIC 9 VALUE 0.
  77 LCT PIC 999 VALUE 0.
  77 PAGECT PIC 999 VALUE 0.
  77 CTR1 PIC 999 VALUE 0.
  77 CTR2 PIC 999 VALUE 0.
*
  01 PARA-CARD.
    02 P-NO PIC X.
    02 P-HEADING PIC X(60).
    02 FILLER PIC X(19).
  01 HEAD1.
    02 FILLER PIC X(03) VALUE SPACES.
    02 HDATE PIC X(08).
    02 FILLER PIC X(14) VALUE SPACES.
    02 FILLER PIC X(55) VALUE
      'N A T I O N A L C O U N C I L F O R S C I E N C E'.
    02 FILLER PIC X(30) VALUE
      ' A N D T E C H N O L O G Y'.
    02 FILLER PIC X(11) VALUE SPACES.
    02 FILLER PIC X(05) VALUE 'PAGE:'.
    02 H1PAGE PIC ZZ9.
    02 FILLER PIC X(04) VALUE SPACES.
*
  01 HEAD2.
    02 FILLER PIC X(45) VALUE SPACES.

```

```

02 FILLER      PIC X(44)  VALUE
   'RESJURSE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER      PIC X(44)  VALUE SPACES.
*
01 HEAD3.
02 FILLER      PIC X(03)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE  'LIST '.
02 H3REPJRT    PIC XXX VALUE SPACES.
02 FILLER      PIC X(34)  VALUE SPACES.
02 H3DESC      PIC X(60)  VALUE  SPACES.
02 H3YEAR      PIC X(07)  VALUE  SPACES.
02 FILLER      PIC X(21)  VALUE SPACES.
*
01 HEAD4.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(60)  VALUE ALL '-'.
02 FILLER      PIC X(28)  VALUE SPACES.
*
01 HEAD5.
02 FILLER      PIC X(31)  VALUE SPACES.
02 H5HEAD      PIC X(15)  VALUE  'N U M B E R  '.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(41)  VALUE
   'D E S C R I P T I O N'.
02 FILLER      PIC X(41)  VALUE SPACES.
*
01 HEAD6.
02 FILLER      PIC X(31)  VALUE SPACES.
02 FILLER      PIC X(15)  VALUE ALL '-'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(41)  VALUE ALL '-'.
02 FILLER      PIC X(41)  VALUE SPACES.
*
01 LINE1.
02 FILLER      PIC X(31).
02 L1-INPT-NO  PIC X(15).
02 FILLER      PIC X(05).
02 L1PNAME     PIC X(64).
02 FILLER      PIC X(18).
*
PROCEDURE DIVISION.
P-START.
  OPEN INPUT INPT-FL
*
  OUTPUT          PRINT-FL.
  MOVE CURRENT-DATE TO H1DATE.
  MOVE SPACES TO LINE1.
  ACCEPT PARA-CARD FROM CREADER.
  IF P-NO NOT NUMERIC OR
    P-HEADING = SPACES
    DISPLAY 'PARA ERROR - RUN ABANDONED'
    STOP RUN.
  IF P-NO = '1' MOVE '91A' TO H3REPORT.
  IF P-NO = '2' MOVE '91B' TO H3REPORT.
  MOVE P-HEADING TO H3DESC.
P-READ-1.
  READ INPT-FL AT END GO TO P-CLOSE-2.
  PERFORM P-HEAD THRU P-HEAD-EXIT.
  PERFORM P-PRINT THRU P-PRINT-EXIT.
  GO TO P-READ-1.
*
P-PRINT.
  MOVE INPT-NO TO L1-INPT-NO.
  MOVE INPT-NAME TO L1PNAME.
  WRITE LP-REC FROM LINE1 AFTER 2.
  SUBTRACT 2 FROM LCT.

```

```

        MOVE SPACES TO LINE1.
P-PRINT-EXIT.
        EXIT.
*
*
P-HEAD.
        IF LCT > 0 GO TO P-HEAD-EXIT.
        ADD 1 TO PAGECT.
        MOVE PAGECT TO H1PAGE.
        WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
        WRITE LP-REC FROM HEAD2 AFTER 2.
        WRITE LP-REC FROM HEAD3 AFTER 2.
        WRITE LP-REC FROM HEAD4 AFTER 1.
P-HD.
        WRITE LP-REC FROM HEAD5 AFTER 2.
        WRITE LP-REC FROM HEAD6 AFTER 1.
        MOVE 50 TO LCT.
P-HEAD-EXIT.
        EXIT.
*
P-CLOSE-2.
        CLOSE
                INPT-FL
                PRINT-FL.
        STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/&
* 88 ECU

```

(viii) PROGRAM RAARP 92

(a) Program Description

3.37 This is a generalised program for listing the following dictionary files:

- Institution Dictionary file - RAARINST
- Subject area Dictionary file - RAARSUBJ
- Fields of Research Dictionary file - RAARFLDS
- Major scientific Equipment Dictionary File - RAAREQUP

3.38 Input - A Diskette containing any of the four dictionary files mentioned above. The keying record length is 80 characters and the files are read into the program as card files labeled as indicated above (see 2.36, 2.37, 2.40, 2.41)

- Parameter card: To supply information on file and heading of the listings.

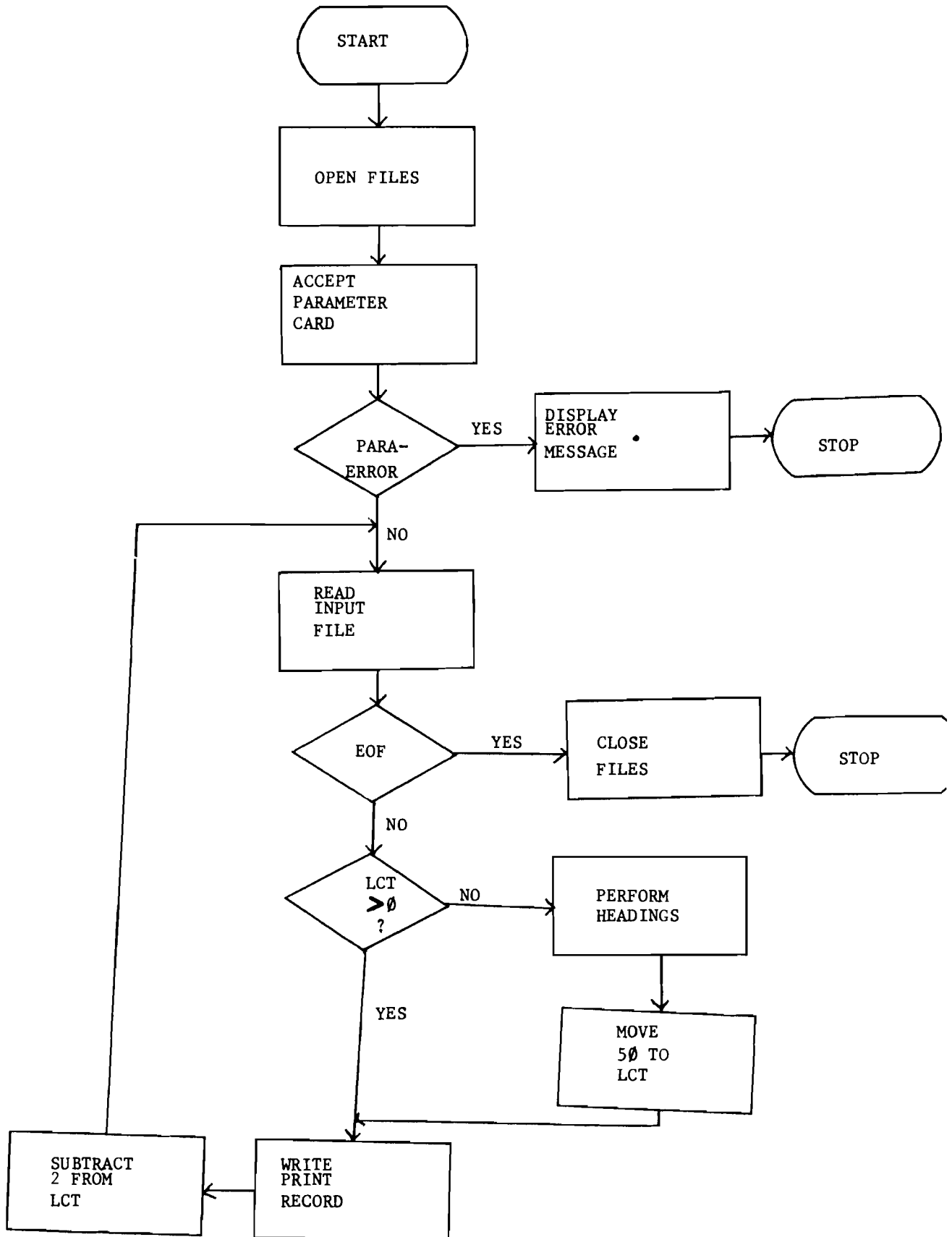
Output: Printout: LIST92A, LIST 92B, LIST 92C, LIST 92D

entitled:

1. INSTITUTION DICTIONARY FILE LISTING
2. SUBJECT AREA DICTIONARY FILE LISTING
3. FIELDS OF RESEARCH DICTIONARY FILE LISTING
4. MAJOR SCIENTIFIC EQUIPMENT DICTIONARY FILE LISTING,
respectively (see Appendices II,III)

(b) Program Procedure

3.39 The program accepts the parameter card, then reads the input file, and prints the appropriate listing. The following pages, give the appropriate program flowchart and listing.



```

* ** JCB JNM=RAARP92,CLASS=A,USER=DP504000
// JCB RAARP92
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
// EXEC FCDBCL,SIZE=64K
CBL NCSEQ,CLIST,SXREF,FLOW=30,STATE
IDENTIFICATION DIVISION.
PROGRAM-ID. RAARP92.
AUTHOR. CKC, AMK, NKM.
ENVIRONMENT DIVISION.
SOURCE-COMPUTER. IBM-370.
OBJECT-COMPUTER. IBM-370.
SPECIAL-NAMES. CO1 IS NEWPAGE
SYSPRT IS CREADER.

```

```

INPUT-OUTPUT SECTION.
FILE-CONTROL.
SELECT RAARINPT ASSIGN TO SYS025-JR-2501-S.
SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.
DATA DIVISION.
FILE SECTION.
FD RAARINPT RECORDING MODE IS F

```

```

LABEL RECORDS ARE OMITTED
DATA RECORDS IS INPT-REC.
VALUE OF ID IS 'RAARXXXXX'.
* **
01 INPT-REC.
02 RAARCODE PIC X(103).
02 RAARNAME PIC X(177).
* **

```

```

FC PRINT-FL RECORDING MODE IS F
LABEL RECORDS ARE OMITTED
DATA RECORDS IS LP-REC.
01 LP-REC.
02 FILLER PIC X(133).
WORKING-STORAGE SECTION.
77 SWI PIC 9 VALUE 0.
77 LCT PIC 999 VALUE 0.
77 PAGECT PIC 999 VALUE 0.
77 CTR1 PIC 999 VALUE 0.
77 CTR2 PIC 999 VALUE 0.
* **

```

```

01 PARA-CARD.
02 P-NO PIC X.
02 P-HEADINGS PIC X(179).
01 HEAD1.
02 FILLER PIC X(103) VALUE SPACES.
02 HDATE PIC X(108).
02 FILLER PIC X(14) VALUE SPACES.
02 FILLER PIC X(55) VALUE

```

```

N A T I O N A L C O U N C I L F O R S C I E N C E .
02 FILLER PIC X(30) VALUE
' A V O T E C H N O L O G Y .
02 FILLER PIC X(11) VALUE SPACES.
02 FILLER PIC X(105) VALUE 'PAGE:'.
02 HIPAGE PIC Z29.
02 FILLER PIC X(104) VALUE SPACES.
* **
01 HEAD2.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(44) VALUE
'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER PIC X(44) VALUE SPACES.
* **

```

```

01 HEAD3.
02 FILLER      PIC X(03)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'LIST '.
02 H3REPORT    PIC XXX VALUE SPACES.
02 FILLER      PIC X(34)  VALUE SPACES.
02 H3DESC      PIC X(60).
02 FILLER      PIC X(28)  VALUE SPACES.
*
01 HEAD4.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(60)  VALUE ALL '-'.
02 FILLER      PIC X(28)  VALUE SPACES.
*
01 HEAD5.
02 FILLER      PIC X(31)  VALUE SPACES.
02 H5HEAD      PIC X(04)  VALUE 'CODE'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(21)  VALUE
'D E S C R I P T I O N'.
02 FILLER      PIC X(72)  VALUE SPACES.
*
01 HEAD6.
02 FILLER      PIC X(31)  VALUE SPACES.
02 FILLER      PIC X(04)  VALUE ALL '-'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(21)  VALUE ALL '-'.
02 FILLER      PIC X(72)  VALUE SPACES.
*
01 LINE1.
02 FILLER      PIC X(31).
02 L1-CODE     PIC X(03).
02 FILLER      PIC X(05).
02 L1PNAME     PIC X(77).
02 FILLER      PIC X(17).
*
PROCEDURE DIVISION.
P-START.
OPEN INPUT RAARINPT
*
OUTPUT          PRINT-FL.
ACCEPT PARA-CARD FROM CREADER.
IF P-NO NOT NUMERIC OR
P-HEADING = SPACES
DISPLAY 'PARAMETER ERROR'
DISPLAY 'RJN ABANDONED' STOP RUN.
IF P-NO = '1' MOVE '92A' TO H3REPORT.
IF P-NO = '2' MOVE '92B' TO H3REPORT.
IF P-NO = '3' MOVE '92C' TO H3REPORT.
IF P-NO = '4' MOVE '92D' TO H3REPORT.
MOVE P-HEADING TO H3DESC.
MOVE CURRENT-DATE TO H1DATE.
MOVE SPACES TO LINE1.
P-READ-1.
READ RAARINPT AT END GO TO P-CLOSE-2.
PERFORM P-HEAD THRU P-HEAD-EXIT.
PERFORM P-PRINT THRU P-PRINT-EXIT.
GO TO P-READ-1.
*
P-PRINT.
MOVE RAARCODE TO L1-CODE.
MOVE RAARNAME TO L1PNAME.
WRITE LP-REC FROM LINE1 AFTER 2.
SUBTRACT 2 FROM LCT.
MOVE SPACES TO LINE1.
P-PRINT-EXIT.
EXIT.

```

```

*
*
P-HEAD.
    IF LCT > 0 GO TO P-HEAD-EXIT.
    ADD 1 TO PAGECT.
    MOVE PAGECT TO H1PAGE.
    WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
    WRITE LP-REC FROM HEAD2 AFTER 2.
    WRITE LP-REC FROM HEAD3 AFTER 2.
    WRITE LP-REC FROM HEAD4 AFTER 1.
P-HD.
    WRITE LP-REC FROM HEAD5 AFTER 2.
    WRITE LP-REC FROM HEAD6 AFTER 1.
    MOVE 50 TO LCT.
P-HEAD-EXIT.
    EXIT.
*
P-CLOSE-2.
    CLOSE RAARINPT
    PRINT-FL.
    STOP RUN.
/*
// L3LTYP TAPE
// EXEC LNKE DT
/*
* ££ EDJ

```

(B) TABULATION PROGRAMS

(i) PROGRAM RAARPØ1A

(a) Program Description

3.40 This program reads two input files viz:- The sorted main data file and the institution dictionary file. Then it extracts record types 01 and 02 from the main data file and produces Table 01A which is entitled.

'MANPOWER RESOURCES IN RESEARCH INSTITUTIONS'

3.41 Input:

- (1) Sorted main data file on magnetic tape
Labelled 'RAARDATA-STØ4 (see 2.21 through 2.34)
- (2) Institution dictionary file on Diskette - 'RAARINST (see 2.36)
- (3) Parameter card - commencement and end dates of survey

Output: Printout - TABLE Ø1A entitled MANPOWER RESOURCES IN RESEARCH INSTITUTIONS (DETAILED) (see Appendices II and III)

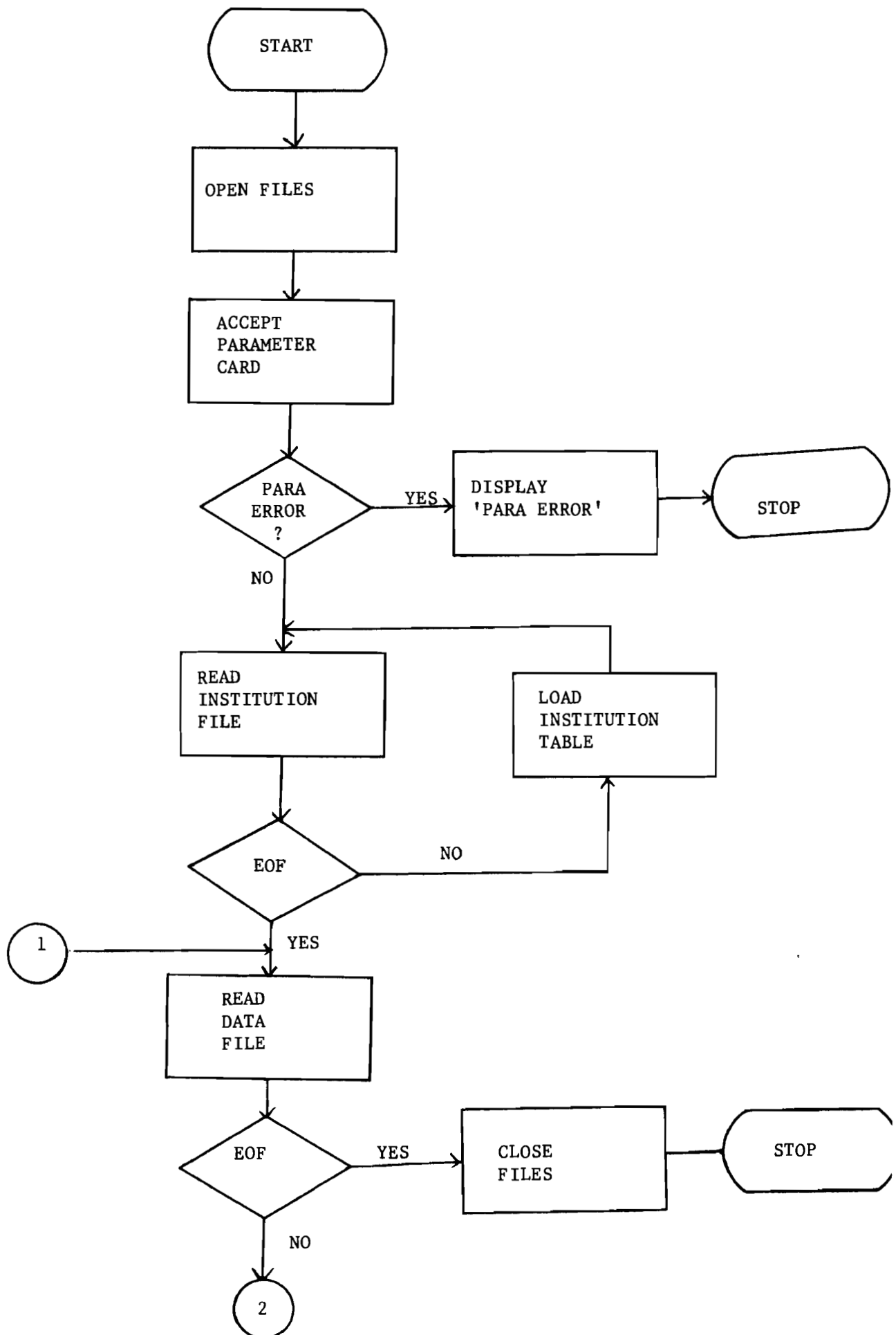
Records selected - Record type Ø1 and Ø2

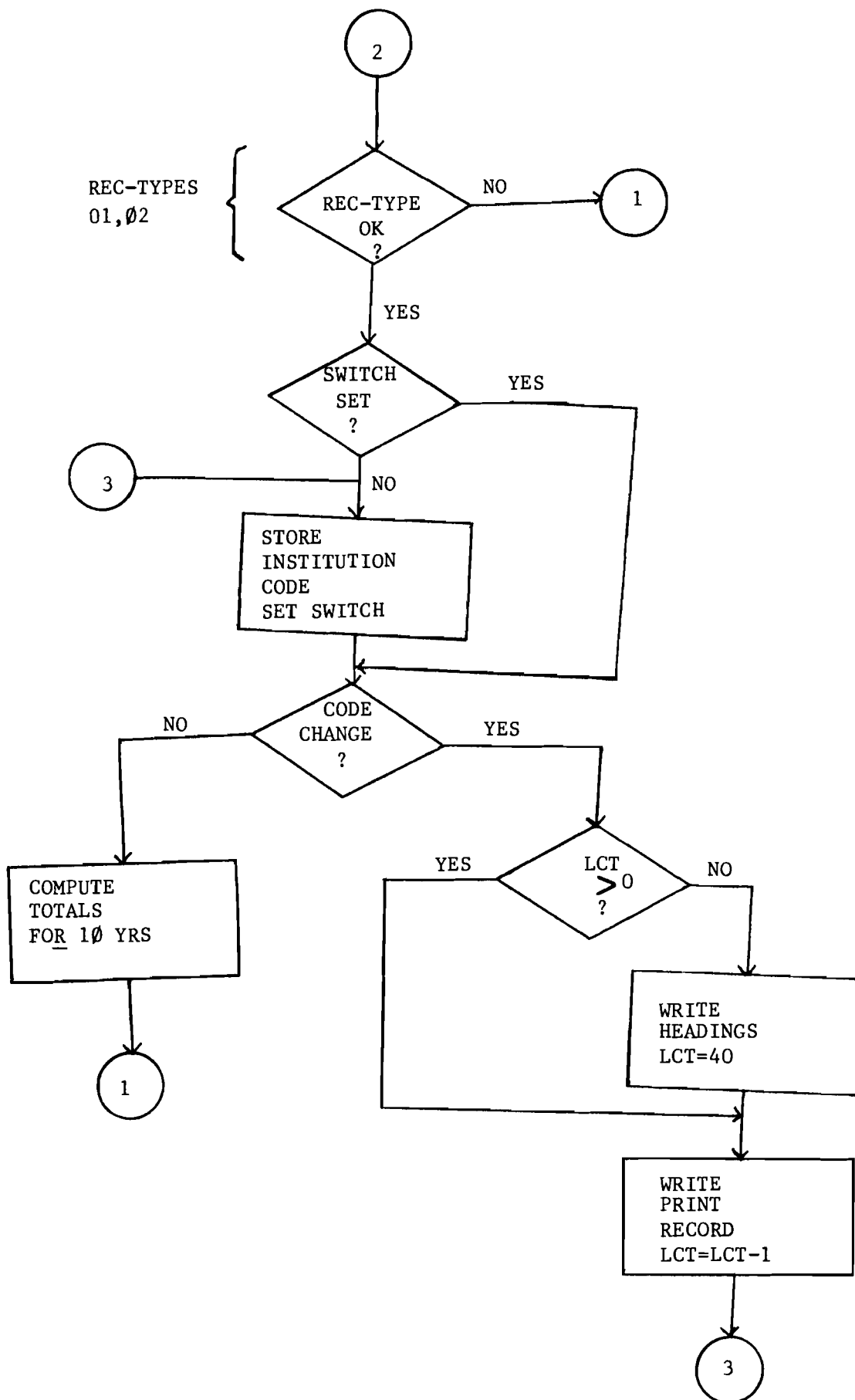
(b) Program Procedure

3.42 The program reads the institution dictionary file, RAARINST, into a table in working storage section - storing the institution name and code as well as the modifier which is subsequently used for the retrieval of the stored data using direct subscripting method. Then the program proceeds to read the sorted RAARDATA-ST Ø4 file, extracting only record types 01 and 02 for processing (see program flowchart and listing in the following pages). The output from the program is a table showing the Distribution of manpower resources in research institutions for a period of ten years starting from 1970/71 upto 1979/80 inclusive. This period is fed into the program via a

parameter card to indicate the commencement and ending dates. A
table for each institution always starts on a new page on the printout.
Columns with unavailable data are printed with dashes (-)

(c) PROGRAM FLOWCHART - RAARP01A





(d) PROGRAM LISTING - RAARP01A

```
* ** JJB JNM=RAARP01A,CLASS=A,USER=OPSD4000
// JJB RAARP01A REPORT 01A
// LIBDEF CL,TJ=USRCL2
// OPTION CATAL
  PHASE RAARP01A,*
// EXEC FCJBDL,SIZE=64K
CBL NOSEQ,CLIST,SXREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
  PROGRAM-ID. RAARP01A.
  AUTHOR. CKC, AWK, AMK, NKM.
  ENVIRONMENT DIVISION.
  CONFIGURATION SECTION.
  SOURCE-COMPUTER. IBM-370.
  OBJECT-COMPUTER. IBM-370.
  SPECIAL-NAMES. COL IS NEWPAGE SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
    SELECT INST-FILE ASSIGN TO SYS025-UR-2501-S.
    SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S
    RESERVE NO ALTERNATE AREA.
  DATA DIVISION.
  FILE SECTION.
    FD INST-FILE RECORDING MODE F.
      LABEL RECORDS OMITTED
      DATA RECORD IS INST-REC.
    * VALVE OF ID IS 'RAARINST'
    01 INST-REC.
      02 RINST-CODE PIC 999.
      02 FILLER PIC X.
      02 RINST-NM PIC X(63).
      02 FILLER PIC X(13).
    FD DATAFILE RECORDING MODE F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS INREC.
    * VALVE OF ID IS 'RAARDATA'.
    01 INREC.
      02 FILLER PIC X(140).
    FD PRINT-FL RECORDING MODE IS F
      LABEL RECORDS OMITTED
      DATA RECORD IS LP-REC.
    01 LP-REC.
      02 FILLER PIC X(133).
  WORKING-STORAGE SECTION.
    77 LCT PIC 999 VALUE 0.
    77 PAGECT PIC 999 VALUE 0.
    77 SW1 PIC 9 VALUE 0.
    77 SW2 PIC 9 VALUE 0.
    77 CTR PIC 999 VALUE 0.
    77 CTR-2 PIC 99 VALUE 0.
    77 CTR2 PIC 99 VALUE 0.
    77 CTR3 PIC 99 VALUE 0.
    77 YEAR-C PIC 9(04) VALUE 0.
    77 YR-C PIC 99 VALUE 0.
    77 SQUAL PIC 99.
    01 SREC PIC X(140).
    01 PARA-CARD.
      02 P-CYEAR PIC X(04).
      02 PCYEAR REDEFINES P-CYEAR PIC 9(04).
      02 FILLER REDEFINES P-CYEAR.
        03 P-YR1 PIC 99.
        03 P-YR2 PIC 99.
      02 P-PRD PIC X(07).
      02 FILLER PIC X(69).
```

```

01 CINST-CODE.
02 CID-CODE          PIC X(03).
02 CID-NO    REDEFINES CID-CODE          PIC 999.
01 TTTALS-A.
02 TD-TDT          PIC 9(03).
02 TA-TDT          PIC 9(03).
02 TOTAL-A          PIC 9(04).
02 RO-TDT          PIC 9(04).
02 TOTAL-STAFF      PIC 9(04).
02 JTHER-TOT-A      PIC 9(04).
02 JTHER-TOT-U      PIC 9(04).
02 JTHER-TOT-T      PIC 9(04).
02 COM-AVG          PIC 9(04).
01 TTTAL-PHD.
02 PHD-TOT          PIC 9(04) OCCURS 10.
01 TTTAL-MSA.
02 MSA-TOT          PIC 9(04) OCCURS 10.
01 TTTAL-BSC.
02 BSC-TOT          PIC 9(04) OCCURS 10.
01 TTTAL-RJ.
02 TOT-RO          PIC 9(04) OCCURS 10.
01 TTTAL-COM.
02 COM-TOT          PIC 9(04) OCCURS 10.
01 WDRKREC.
02 WREC-01.
03 WINST-CODE      PIC X(03).
03 WSJRV-YEAR      PIC XX.
03 FILLER          PIC X.
03 REC-TYPE        PIC XX.
03 WREC-TYPE REDEFINES REC-TYPE PIC 99.
03 WDIRECTOR-VM    PIC X(15).
03 WQJAL.
04 QUAL-1          PIC XX OCCURS 5.
03 FILLER          PIC X(107).
02 WREC-02 REDEFINES WREC-01.
03 FILLER          PIC X(08).
03 WYEARS.
04 WPHDYEAR OCCURS 10.
05 WPHD-1          PIC XX.
05 WPHD-YEARS REDEFINES WPHD-1 PIC 99.
04 WMSCYEAR OCCURS 10.
05 WMSC-1          PIC XX.
05 WMSC-YEARS REDEFINES WMSC-1 PIC 99.
04 WBSCYEAR OCCURS 10.
05 WBSC-1          PIC XX.
05 WBSC-YEARS REDEFINES WBSC-1 PIC 99.
03 FILLER4.
04 WSEN-TECH      PIC 99.
04 WTECH          PIC 99.
04 WTECHN         PIC 99.
04 WEXEC          PIC 99.
04 WCLER          PIC 99.
04 WARTSAN        PIC 99.
04 WUNSKIL        PIC 99.
03 FILLER          PIC X(57).
01 QJALIF-TABLE.
02 FILLER          PIC X(08) VALUE '01BSC '.
02 FILLER          PIC X(08) VALUE '02BSCA '.
02 FILLER          PIC X(08) VALUE '03BA '.
02 FILLER          PIC X(08) VALUE '04BENG '.
02 FILLER          PIC X(08) VALUE '05BCOM '.
02 FILLER          PIC X(08) VALUE '06BVM '.
02 FILLER          PIC X(08) VALUE '07MSC '.
02 FILLER          PIC X(08) VALUE '08MA '.
02 FILLER          PIC X(08) VALUE '09PHD '.
01 FILLER REDEFINES QUALIF-TABLE.

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02 FILLER OCCURS 9.
03   QUAL-CODE      PIC XX.
03   QUAL-DEGREE    PIC X(04).
03   FILLER          PIC X(02).
01 LINE1.
02 FILLER          PIC X(03).
02 L1YEAR1        PIC X(04).
02 L1OBLIQ        PIC X.
02 L1YEAR2        PIC XX.
02 FILLER          PIC X(06).
02 L1DEGRE.
03   L1QJAL        PIC X(04) OCCURS 5.
02 L1DEG REDEFINES L1DEGRE PIC X(20).
02 FILLER          PIC X(02).
02 L1P4D          PIC ZZ9.
02 FILLER          PIC X(05).
02 L1MSC          PIC ZZ9.
02 FILLER          PIC X(05).
02 L1BSC          PIC ZZ9.
02 FILLER          PIC X(05).
02 L1TJT-1        PIC ZZ9.
02 FILLER          PIC X(05).
02 L1TECH         PIC ZZ9.
02 FILLER          PIC X(05).
02 L1TECHN        PIC ZZ9.
02 FILLER          PIC X(05).
02 L1TJT-TS       PIC ZZ9.
02 FILLER          PIC X(05).
02 L1OSUP-A       PIC ZZ9.
02 FILLER          PIC X(05).
02 L1OSUP-J       PIC ZZ9.
02 FILLER          PIC X(05).
02 L1OSUP-T       PIC ZZ9.
02 FILLER          PIC X(05).
02 L1TJTAL        PIC ZZ9.
02 FILLER          PIC X(08).
01 FILLER1 REDEFINES LINE1.
02 LINE12         PIC X(30).
02 FILLER          PIC X(103).
01 FILLER2 REDEFINES FILLER1.
02 FILLER          PIC X(38).
02 L1P4D-X        PIC X(03).
02 FILLER          PIC X(05).
02 L1MSC-X        PIC X(03).
02 FILLER          PIC X(05).
02 L1BSC-X        PIC X(03).
02 FILLER          PIC X(05).
02 L1TJT-A-X      PIC X(04).
02 FILLER          PIC X(05).
02 L1TECH-X       PIC X(03).
02 FILLER          PIC X(05).
02 L1TECHN-X      PIC X(03).
02 FILLER          PIC X(05).
02 L1TJT-TS-X     PIC X(04).
02 FILLER          PIC X(05).
02 L1OSUP-A-X     PIC X(03).
02 FILLER          PIC X(05).
02 L1OSUP-J-X     PIC X(03).
02 FILLER          PIC X(05).
02 L1OSUP-T-X     PIC X(04).
02 FILLER          PIC X(05).
02 L1TJTAL-X      PIC X(04).
02 FILLER          PIC X(08).
01 INST-TABLE.
02 TINST-CODE     PIC X(03) OCCURS 150.
02 TINST-NM       PIC X(63) OCCURS 150.

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02 1MODE PIC X(03) OCCURS 999.
01 HEAD1.
02 FILLER PIC X(03) VALUE SPACES.
02 HDATE PIC X(08).
02 FILLER PIC X(14) VALUE SPACES.
02 FILLER PIC X(55) VALUE
  'N A T I O N A L C O U N C I L F O R S C I E N C E '.
02 FILLER PIC X(30) VALUE
  ' A N D T E C H N I C I A N S '.
02 FILLER PIC X(11) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'PAGE:'.
02 H1PAGE PIC ZZ9.
02 FILLER PIC X(04) VALUE SPACES.
*
01 HEAD2.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(44) VALUE
  'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER PIC X(44) VALUE SPACES.
*
01 HEAD3.
02 FILLER PIC X(12) VALUE 'TABLE 01A'.
02 FILLER PIC X(34) VALUE SPACES.
02 FILLER PIC X(43) VALUE
  'MANPOWER RESOURCES IN RESEARCH INSTITUTIONS'.
02 FILLER PIC X VALUE SPACES.
02 H3YEAR PIC X(07) VALUE SPACES.
02 FILLER PIC X(36) VALUE SPACES.
*
01 HEAD4.
02 FILLER PIC X(46) VALUE SPACES.
02 FILLER PIC X(42) VALUE ALL '-'.
02 FILLER PIC X(45) VALUE SPACES.
*
01 HEAD5.
02 FILLER PIC X(16) VALUE SPACES.
02 FILLER PIC X(27) VALUE
  'INSTITUTION CODE & NAME:- '.
02 H5CODE PIC XXX.
02 FILLER PIC XX VALUE SPACES.
02 H5NAME PIC X(63).
02 FILLER PIC X(22) VALUE SPACES.
*
01 HEAD5A.
02 FILLER PIC X(18) VALUE SPACES.
02 FILLER PIC X(50) VALUE
  'R E S E A R C H D E F I C I E N C Y '.
02 FILLER PIC X(04) VALUE SPACES.
02 FILLER PIC X(23) VALUE
  'TECHNICAL SUPPORT '.
02 FILLER PIC X(27) VALUE 'OTHER SUPPORT '.
02 FILLER PIC X(27) VALUE SPACES.
01 HEAD6.
02 FILLER PIC X(16) VALUE SPACES.
02 FILLER PIC X(19) VALUE
  'DIRECTOR OR OFFICER'.
02 FILLER PIC X(25) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'TOTAL'.
02 FILLER PIC X(20) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'TOTAL'.
02 FILLER PIC X(20) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'TOTAL'.
02 FILLER PIC X(04) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'TOTAL'.
02 FILLER PIC X(08) VALUE SPACES.

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01 HEAD7.
02 FILLER      PIC X(11)  VALUE '   YEAR   '.
02 FILLER      PIC X(05)  VALUE  SPACES.
02 FILLER      PIC X(20)  VALUE 'I/C - QUALIFICATIONS'.
02 FILLER      PIC X(02)  VALUE  SPACES.
02 FILLER      PIC X(53)  VALUE
    'PHD      MSC      BSC      R.O.      T.O.      T.A.      T.S.'.
02 FILLER      PIC X(34)  VALUE
    '   ADMIN.  UNSKILD  OTHER      STAFF'.
02 FILLER      PIC X(08)  VALUE  SPACES.
PROCEDURE DIVISION.
P-START.
    OPEN INPUT INST-FILE DATAFILE
        OUTPUT PRINT-FL.
    MOVE SPACES TO LINE1 INST-TABLE.
    MOVE CURRENT-DATE TO HDATE.
    MOVE ZEROS TO TOTALS-A.
    ACCEPT PARA-CARD FROM CREADER.
    MOVE P-PRD TO H3YEAR.
    MOVE PCYEAR TO YEAR-C.
    MOVE P-YR2 TO YR-C.
    ADD 1 TO YR-C.
P-READ-1.
    READ INST-FILE AT END GO TO P-CLOSE-1.
    MOVE RINST-CODE TO TINST-CODE (CTR).
    MOVE RINST-NM TO TINST-NM (CTR).
    MOVE CTR TO TMODE (RINST-CODE).
    ADD 1 TO CTR.
    GO TO P-READ-1.
*
P-CLOSE-1.
    CLOSE INST-FILE.
*
P-READ-2.
    READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
    IF REC-TYPE NOT NUMERIC GO TO P-READ-2.
    IF WREC-TYPE > 02 GO TO P-READ-2.
    IF SW1 = 1 GO TO P-R4.
    MOVE 1 TO SW1.
P-STORE-R3.
    MOVE WINST-CODE TO CID-CODE.
P-R4.
    IF WINST-CODE NOT = CID-NO GO TO P-CHANGE-R3.
    IF WREC-TYPE NOT = 01 GO TO P-RECORD-2.
    PERFORM P-HEAD THRU P-HEAD-EXIT.
    MOVE WORKREC TO SREC.
    GO TO P-READ-2.
P-RECORD-2.
    IF WREC-TYPE NOT = 02 GO TO P-READ-2.
    PERFORM P-PREP-LINE1 THRU P-PREP-EXIT.
    GO TO P-READ-2.
P-CHANGE-R3.
    PERFORM P-AVERAGE THRU P-AVG-EXIT.
    GO TO P-STORE-R3.
P-HEAD.
    ADD 1 TO PAGECT.
    MOVE PAGECT TO H1PAGE.
    WRITE LP-REC          FROM HEAD1 AFTER NEWPAGE.
    WRITE LP-REC          FROM HEAD2 AFTER 1.
    WRITE LP-REC          FROM HEAD3 AFTER 2.
    WRITE LP-REC          FROM HEAD4 AFTER 1.
    MOVE TMODE (CID-NO) TO CTR.
    MOVE TINST-NM (CTR) TO H5NAME.
    MOVE CID-CODE TO H5CODE.
    WRITE LP-REC          FROM HEAD5 AFTER 2.
    WRITE LP-REC          FROM HEAD5A AFTER 2.

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        WRITE LP-REC          FROM HEAD6 AFTER 2.
        WRITE LP-REC          FROM HEAD7 AFTER 1.
P-HEAD-EXIT.
        EXIT.
P-PREP-QUAL.
        EXAMINE WQUAL REPLACING ALL SPACES BY ZEROS.
        MOVE 1 TO LCT CTR-2.
P-LJOP.
        IF QUAL-1 (LCT) NOT = '00' GO TO P-LJOP-C.
        ADD 1 TO LCT.
        IF LCT > 05 GO TO P-QUAL-EXIT.
        GO TO P-LJOP.
P-LJOP-C.
        MOVE QUAL-1 (LCT) TO SQUAL.
        MOVE QUAL-DEGREE (SQUAL) TO LIQJAL (CTR-2).
        ADD 1 TO CTR-2 LCT.
        IF LCT > 5 GO TO P-QUAL-EXIT.
        GO TO P-LJOP.
P-QUAL-EXIT.
        EXIT.
P-PREP-LINE1.
        MOVE ZEROS TO TOTAL-PHD TOTAL-MSD TOTAL-BSC
                        TOTAL-RO TOTAL-COM.
        MOVE PCYEAR TO YEAR-C.
        MOVE P-YR2 TO YR-C.
        ADD 1 TO YR-C.
        MOVE 1 TO CTR.
P-PR-LJOP.
        MOVE YEAR-C TO LIYEAR1.
        MOVE '/' TO LIOBLIQ.
        MOVE YR-C TO LIYEAR2.
        EXAMINE WPHD-1 (CTR)    REPLACING ALL SPACES BY ZEROS.
        EXAMINE WMSC-1 (CTR)    REPLACING ALL SPACES BY ZEROS.
        EXAMINE WBSC-1 (CTR)    REPLACING ALL SPACES BY ZEROS.
        IF WPHD-YEARS (CTR) = 0 MOVE ALL '-' TO LIPHD-X ELSE
        MOVE WPHD-YEARS (CTR)   TO LIPHD PHD-TOT (CTR).
        IF WMSC-YEARS (CTR) = 0 MOVE ALL '-' TO LIMSC-X ELSE
        MOVE WMSC-YEARS (CTR)   TO LIMSC MSC-TOT (CTR).
        IF WBSC-YEARS (CTR) = 0 MOVE ALL '-' TO LIBSC-X ELSE
        MOVE WBSC-YEARS (CTR)   TO LIBSC BSC-TOT (CTR).
        ADD WPHD-YEARS (CTR)
            WMSC-YEARS (CTR)
            WBSC-YEARS (CTR) GIVING RO-TOT.
        IF RO-TOT = 0 MOVE ALL '-' TO LITOT-A-X ELSE
        MOVE RO-TOT TO LITOT-1 TOT-RO (CTR).
        IF CTR = 10 GO TO P-CONTINUE.
        MOVE ALL '-' TO
                                LITECH-X
                                LITECHN-X
                                LITOT-TS-X
                                LIDSUP-A-X
                                LIDSUP-U-X
                                LIDSUP-T-X
                                LITOTAL-X.
        WRITE LP-REC FROM LINE1 AFTER 2.
        MOVE SPACES TO LINE1.
        IF CTR < 10
            ADD 1 TO CTR YEAR-C YR-C
            GO TO P-PR-LJOP.
P-CONTINUE.
        EXAMINE FILLER4 REPLACING ALL SPACES BY ZEROS.
        ADD WSEV-TECH WTECH      GIVING TJ-TOT.
        MOVE WTECHN TO TA-TOT.
        ADD TJ-TOT TA-TOT        GIVING TOTAL-A.
        ADD WEXEC WCLER WARTSAN GIVING OTHER-TOT-A.
        MOVE WJNSKIL TO OTHER-TOT-U.

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ADD OTHER-TOT-A OTHER-TOT-U GIVING OTHER-TOT-T.
MOVE TO-TOT TO LITECH.
MOVE TA-TOT TO LITECHN.
MOVE TOTAL-A TO LITOT-TS.
MOVE OTHER-TOT-A TO LIOSJP-A.
MOVE OTHER-TOT-U TO LIOSJP-U.
MOVE OTHER-TOT-T TO LIOSJP-T.
ADD RO-TOT TOTAL-A OTHER-TOT-T GIVING TOTAL-STAFF.
MOVE TOTAL-STAFF TO LITOTAL.
MOVE SREC TO WORKREC.
PERFORM P-PREP-QUAL THRU P-QUAL-EXIT.
WRITE LP-REC FROM LINE1 AFTER 2.
MOVE SPACES TO LINE1.
* PERFORM P-STOT THRU P-STOT-EXIT.
P-PREP-EXIT.
EXIT.
P-AVERAGE.
MOVE * AVERAGE NO. P.A. * TO LINE12.
MOVE TOTAL-PHD TO TOTAL-COM.
PERFORM P-CALC-AVG THRU P-CALC-EXIT.
MOVE COM-AVG TO LIPHD.
MOVE 0 TO COM-AVG.
MOVE TOTAL-MSC TO TOTAL-COM.
PERFORM P-CALC-AVG THRU P-CALC-EXIT.
MOVE COM-AVG TO LIMSC.
MOVE 0 TO COM-AVG.
MOVE TOTAL-BSC TO TOTAL-COM.
PERFORM P-CALC-AVG THRU P-CALC-EXIT.
MOVE COM-AVG TO LIBSC.
MOVE 0 TO COM-AVG.
MOVE TOTAL-RO TO TOTAL-COM.
PERFORM P-CALC-AVG THRU P-CALC-EXIT.
MOVE COM-AVG TO LITOT-1.
MOVE 0 TO COM-AVG.
MOVE ALL *-* TO
    LITECH-X
    LITECHN-X
    LITOT-TS-X
    LIOSJP-A-X
    LIOSJP-U-X
    LIOSJP-T-X
    LITOTAL-X.
WRITE LP-REC FROM LINE1 AFTER 2.
MOVE SPACES TO LINE1.
P-AVG-EXIT.
EXIT.
P-CALC-AVG.
MOVE 1 TO CTR2.
MOVE 0 TO COM-AVG CTR3 SW2.
P-CALC-LOOP.
IF SW2 = 1 GO TO P-CALC.
IF CTR2 > 10 GO TO P-CALC-EXIT.
IF COM-TOT (CTR2) NOT = 0 MOVE 1 TO SW2
    ELSE ADD 1 TO CTR2 GO TO P-CALC-LOOP.
P-CALC.
ADD 1 TO CTR3.
ADD COM-TOT (CTR2) TO COM-AVG.
IF CTR2 NOT = 10
    ADD 1 TO CTR2
    GO TO P-CALC-LOOP.
DIVIDE CTR3 INTO COM-AVG ROUNDED.
P-CALC-EXIT.
EXIT.
P-CLOSE-2.
PERFORM P-AVERAGE THRU P-AVG-EXIT.
CLOSE DATAFILE.

```

STOP RUN.

/*

// LBLTYP TAPE

// EXEC LN<EDT

/*

/&

* ££ EDJ

(ii) PROGRAM RAARPØ1B

(a) Program Description

3.43 This program reads two input files viz: The sorted main data file and the institution dictionary file. It also extracts record types 01 and 02 and produces a summary table 01B (out of table 01A) based on the latest year of survey.

3.44 Input:

(1) Sorted main data file on magnetic tape labelled 'RAARDATA-STØ5'
(see 2.21 through 2.34)

(2) Institution Dictionary file on diskette, labelled 'RAARINST'
(see 2.36)

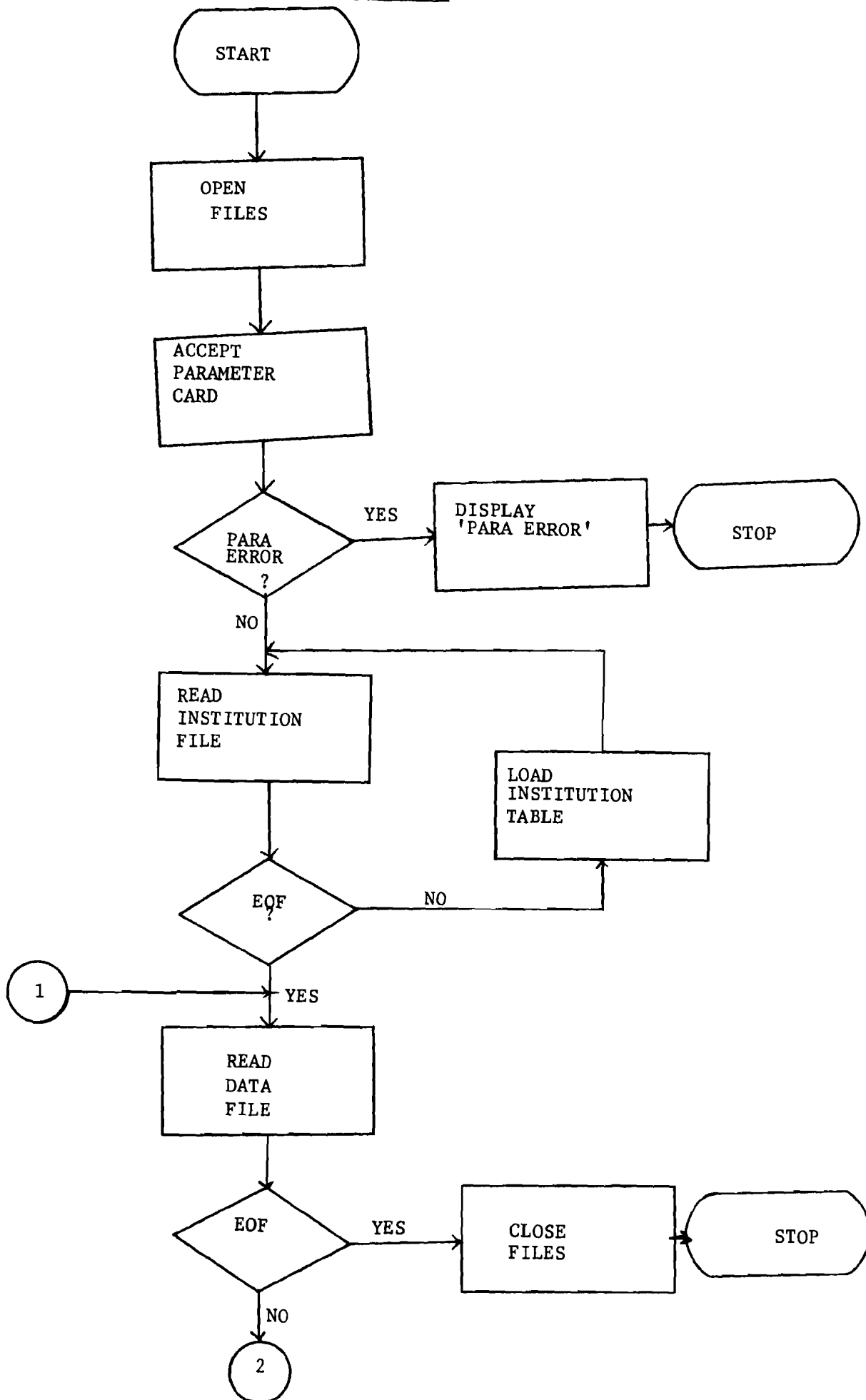
(3) Parameter card - latest year of survey

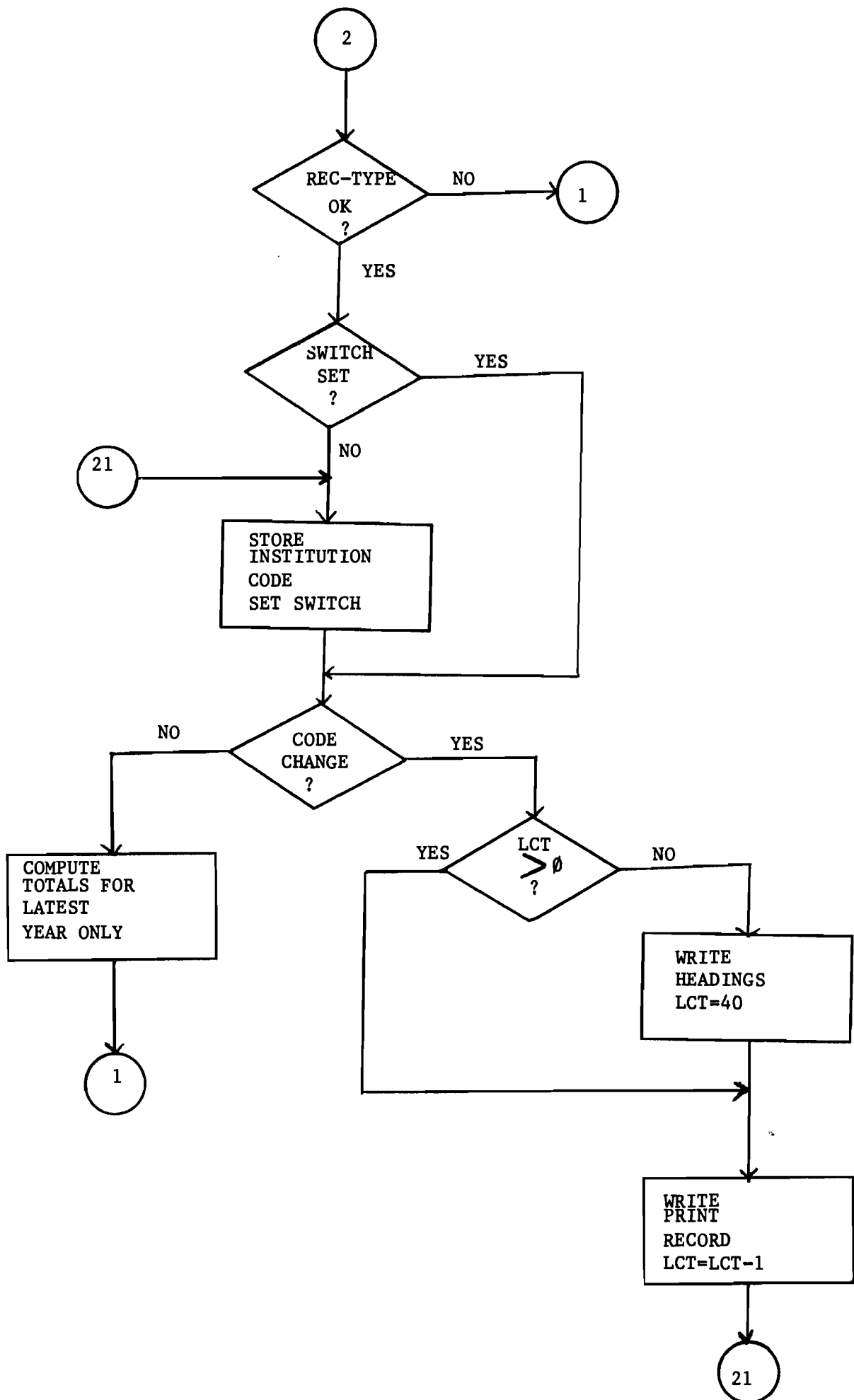
Output: Printout - TABLE Ø1B entitled: MANPOWER RESOURCES IN RESEARCH INSTITUTIONS (SUMMARY) (see Appendices II and III)

(b) Program Procedure

3.45 The program first reads the institution dictionary file RAARINST and builds an institution table in working storage. Then it reads the sorted RAARDATA-STØ1 file, skipping all records greater than type 02. A parameter card to indicate the latest year of survey is also read and the program then produces a summary table to table 01A. (see also the following program flowchart and listing)

(c) PROGRAM FLOWCHART RAARPØ1B





(d) PROGRAM LISTING - RAARP01A

```
* ** JOB JNM=RAARP01B,CLASS=A,USER=OPS04000
// JOB RAARP01B      REPORT 01 SUMMARY
// LIBDEF CL,TD=JSRCL2
// OPTION CATAL
  PHASE RAARP01B,*
// EXEC FC0B0L,SIZE=64K
CBL NOSEQ,CLIST, SXREF, FLOW=30, STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP01B.
    AUTHOR. CKC, AMK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES. CO1 IS NEWPAGE
                  SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
    SELECT INST-FILE ASSIGN TO SYS025-UR-2501-S.
    SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S
    RESERVE NO ALTERNATE AREA.
  DATA DIVISION.
  FILE SECTION.
    FD INST-FILE      RECORDING MODE F
      LABEL RECORDS OMITTED
      DATA RECORD IS INST-REC.
    * VALVE OF ID IS 'RAARINST'
    01 INST-REC.
      02 RINST-CODE      PIC 999.
      02 FILLER          PIC X.
      02 RINST-VM        PIC X(63).
      02 FILLER          PIC X(13).
    FD DATAFILE      RECORDING MODE F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS INREC.
    * VALUE OF ID IS 'RAARDATA'.
    01 INREC.
      02 FILLER          PIC X(140).
    FD PRINT-FL       RECORDING MODE IS F
      LABEL RECORDS OMITTED
      DATA RECORD IS LP-REC.
    01 LP-REC.
      02 FILLER          PIC X(133).
  WORKING-STORAGE SECTION.
    77 LCT             PIC 999      VALUE 0.
    77 LCT-1           PIC 999      VALUE 0.
    77 PAGECT          PIC 999      VALUE 0.
    77 SW1             PIC 9        VALUE 0.
    77 CTR             PIC 999      VALUE 0.
    77 CTR-2           PIC 99       VALUE 0.
    77 YEAR-C          PIC 9(04)    VALUE 1970.
    77 YR-C            PIC 99       VALUE 71.
    77 SQUAL           PIC 99.
    01 CINST-CODE.
      02 CID-CODE       PIC X(03).
      02 CID-NO        REDEFINES CID-CODE      PIC 999.
    01 TTOTALS-A.
      02 TO-TJT         PIC 9(03).
      02 TA-TJT         PIC 9(03).
      02 TOTAL-A        PIC 9(04).
      02 RO-TOT         PIC 9(04).
      02 TOTAL-STAFF    PIC 9(04).
      02 OTHER-TOT-A    PIC 9(04).
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02 OTHER-TOT-U      PIC 9(04).
02 OTHER-TOT-T      PIC 9(04).
01 GRAND-TOTALS.
02 GTOT-PHD         PIC 9(04).
02 GTOT-MSC         PIC 9(04).
02 GTOT-BSC         PIC 9(04).
02 GTOT-RO          PIC 9(04).
02 GTOT-TO          PIC 9(04).
02 GTOT-TA          PIC 9(04).
02 GTOT-TS          PIC 9(04).
02 GTOT-OTHER-A     PIC 9(04).
02 GTOT-OTHER-U     PIC 9(04).
02 GTOT-OTHER-T     PIC 9(04).
02 GTOT-STAFF       PIC 9(04).
01 WJRKREC.
02 WREC-01.
03  #INST-CODE      PIC X(03).
03  #SJR-V-YEAR     PIC XX.
03  FILLER          PIC X.
03  REC-TYPE        PIC XX.
03  WREC-TYPE REDEFINES REC-TYPE PIC 99.
03  #DIRECTOR-VM    PIC X(15).
03  #QJAL.
04  QUAL-1         PIC XX OCCURS 5.
03  FILLER          PIC X(107).
02 WREC-02 REDEFINES WREC-01.
03  FILLER          PIC X(08).
03  #YEARS.
04  WPHDYEAR OCCURS 10.
05  WPHD-1         PIC XX.
05  WPHD-YEARS REDEFINES WPHD-1 PIC 99.
04  WMSCYEARS OCCURS 10.
05  WMSC-1         PIC XX.
05  WMSC-YEARS REDEFINES WMSC-1 PIC 99.
04  WBSCYEARS OCCURS 10.
05  WBSC-1         PIC XX.
05  WBSC-YEARS REDEFINES WBSC-1 PIC 99.
03  FILLER4.
04  #SEN-TECH      PIC 99.
04  #TECH          PIC 99.
04  #TECHN         PIC 99.
04  #EXEC          PIC 99.
04  #CLER          PIC 99.
04  #ARTSAN        PIC 99.
04  #UNSKIL        PIC 999.
03  FILLER          PIC X(57).
01 QJALIF-TABLE.
02  FILLER          PIC X(08) VALUE '01BSC  '.
02  FILLER          PIC X(08) VALUE '02BSCA  '.
02  FILLER          PIC X(08) VALUE '03BA    '.
02  FILLER          PIC X(08) VALUE '04BENG  '.
02  FILLER          PIC X(08) VALUE '05BCOM  '.
02  FILLER          PIC X(08) VALUE '06BVM   '.
02  FILLER          PIC X(08) VALUE '07MSC   '.
02  FILLER          PIC X(08) VALUE '08MA    '.
02  FILLER          PIC X(08) VALUE '09PHD   '.
01 FILLER REDEFINES QJALIF-TABLE.
02  FILLER OCCURS 9.
03  QUAL-CODE      PIC XX.
03  QUAL-DEGREE    PIC X(04).
03  FILLER          PIC X(02).
01 LINE1.
02  FILLER          PIC X(03).
02  LI-CODE        PIC X(03).
02  FILLER          PIC X(04).
02  LI-INST        PIC X(26).

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02 FILLER      PIC X(02).
02 L1PHD      PIC ZZ9.
02 FILLER      PIC X(05).
02 LIMSC      PIC ZZ9.
02 FILLER      PIC X(05).
02 L1BSC      PIC ZZ9.
02 FILLER      PIC X(05).
02 L1TDT-1    PIC ZZZ9.
02 FILLER      PIC X(05).
02 L1TECH      PIC ZZ9.
02 FILLER      PIC X(05).
02 L1TECHN     PIC ZZ9.
02 FILLER      PIC X(05).
02 L1TDT-TS    PIC ZZZ9.
02 FILLER      PIC X(05).
02 L1OSUP-A    PIC ZZ9.
02 FILLER      PIC X(05).
02 L1OSUP-J    PIC ZZ9.
02 FILLER      PIC X(05).
02 L1OSUP-T    PIC ZZZ9.
02 FILLER      PIC X(05).
02 L1DTAL      PIC ZZZ9.
02 FILLER      PIC X(08).
01 FILLER1 REDEFINES LINE1.
02 LINE12     PIC X(30).
02 FILLER      PIC X(103).
01 FILLER2 REDEFINES FILLER1.
02 FILLER      PIC X(38).
02 L1PHD-X     PIC X(03).
02 FILLER      PIC X(05).
02 LIMSC-X     PIC X(03).
02 FILLER      PIC X(05).
02 L1BSC-X     PIC X(03).
02 FILLER      PIC X(05).
02 L1TDT-A-X   PIC X(04).
02 FILLER      PIC X(05).
02 L1TECH-X    PIC X(03).
02 FILLER      PIC X(05).
02 L1TECHN-X   PIC X(03).
02 FILLER      PIC X(05).
02 L1TDT-TS-X  PIC X(04).
02 FILLER      PIC X(05).
02 L1OSUP-A-X  PIC X(03).
02 FILLER      PIC X(05).
02 L1OSUP-J-X  PIC X(03).
02 FILLER      PIC X(05).
02 L1OSUP-T-X  PIC X(04).
02 FILLER      PIC X(05).
02 L1DTAL-X    PIC X(04).
02 FILLER      PIC X(08).
01 INST-TABLE.
02 TINST-CODE  PIC X(03) OCCURS 150.
02 TINST-NM    PIC X(63) OCCURS 150.
02 TMODE       PIC X(03) OCCURS 999.
01 HEAD1.
02 FILLER      PIC X(03) VALUE SPACES.
02 HDATE       PIC X(08).
02 FILLER      PIC X(14) VALUE SPACES.
02 FILLER      PIC X(55) VALUE
  'N A T I O N A L C O U N C I L F O R S C I E N C E'.
02 FILLER      PIC X(30) VALUE
  ' A N D T E C H N O L O G Y'.
02 FILLER      PIC X(11) VALUE SPACES.
02 FILLER      PIC X(05) VALUE 'PAGE:'.
02 H1PAGE      PIC ZZ9.
02 FILLER      PIC X(04) VALUE SPACES.

```

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*
01 HEAD2.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(44)  VALUE
    'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER      PIC X(44)  VALUE SPACES.

*
01 HEAD3.
02 FILLER      PIC X(12)  VALUE '  TABLE 01B'.
02 FILLER      PIC X(34)  VALUE SPACES.
02 FILLER      PIC X(44)  VALUE
    'MANPOWER RESOURCES IN RESEARCH INSTITUTIONS '.
02 FILLER      PIC X VALUE SPACES.
02 H3YEAR      PIC X(07) VALUE SPACES.
02 FILLER      PIC X(10) VALUE ' (SUMMARY)'.
02 FILLER      PIC X(26)  VALUE SPACES.

*
01 HEAD4.
02 FILLER      PIC X(46)  VALUE SPACES.
02 FILLER      PIC X(62)  VALUE ALL '-'.
02 FILLER      PIC X(26)  VALUE SPACES.

*
01 HEAD5.
02 FILLER      PIC X(16)  VALUE SPACES.
02 FILLER      PIC X(27)  VALUE
    'INSTITUTION CODE & NAME:- '.
02 H5CODE      PIC XXX.
02 FILLER      PIC XX     VALUE SPACES.
02 H5NAME      PIC X(63).
02 FILLER      PIC X(22)  VALUE SPACES.

*
01 HEAD5A.
02 FILLER      PIC X(18)  VALUE SPACES.
02 FILLER      PIC X(50)  VALUE
    'R E S E A R C H   O F F I C E R S '.
02 FILLER      PIC X(04)  VALUE SPACES.
02 FILLER      PIC X(23)  VALUE
    ' TECHNICAL SUPPORT '.
02 FILLER      PIC X(27)  VALUE ' D T H E R S U P P O R T '.
02 FILLER      PIC X(27)  VALUE SPACES.

01 HEAD6.
02 FILLER      PIC X(03)  VALUE SPACES.
02 FILLER      PIC X(04)  VALUE 'CODE'.
02 FILLER      PIC X(02)  VALUE SPACES.
02 FILLER      PIC X(16)  VALUE 'INSTITUTION NAME'.
02 FILLER      PIC X(36)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'TOTAL'.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'TOTAL'.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'TOTAL'.
02 FILLER      PIC X(04)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'TOTAL'.
02 FILLER      PIC X(08)  VALUE SPACES.

*
01 HEAD7.
02 FILLER      PIC X(11)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(02)  VALUE SPACES.
02 FILLER      PIC X(53)  VALUE
    'PHD      MSC      BSC      R.O.      T.O.      T.A.      T.S.'.
02 FILLER      PIC X(34)  VALUE
    ' ADMIN. UNSKILD OTHER STAFF'.
02 FILLER      PIC X(08)  VALUE SPACES.

01 HEAD8.

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02 FILLER      PIC XXX  VALUE SPACES.
02 HBYEAR1     PIC 9(04).
02 FILLER      PIC X    VALUE  '/'.
02 HBYEAR2     PIC 99.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(20) VALUE ALL '-'.
02 FILLER      PIC X(02) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(04) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(04) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(04) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(04) VALUE ALL '-'.
02 FILLER      PIC X(08) VALUE ALL SPACES.
01 PARA-CARD.
    02 P-YEAR      PIC X(07).
    02 FILLER      PIC X(73).
PROCEDURE DIVISION.
P-START.
    OPEN INPUT INST-FILE DATAFILE
        OUTPUT PRINT-FL.
    MOVE SPACES TO LINE1 INST-TABLE.
    MOVE CURRENT-DATE TO HDATE.
    MOVE ZEROS TO TOTALS-A GRAND-TOTALS.
    ACCEPT PARA-CARD FROM CREATER.
    IF P-YEAR = SPACES
        DISPLAY 'PARAMETER ERROR' PARA-CARD
        DISPLAY 'RUN ABANDONED' STOP RUN.
    MOVE P-YEAR TO H3YEAR.
P-READ-1.
    READ INST-FILE AT END GO TO P-CLOSE-1.
    MOVE RINST-CODE TO TINST-CODE (CTR).
    MOVE RINST-NM TO TINST-NM (CTR).
    MOVE CTR TO TMODE (RINST-CODE).
    ADD 1 TO CTR.
    GO TO P-READ-1.
*
P-CLOSE-1.
    CLOSE INST-FILE.
*
P-READ-2.
    READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
    IF REC-TYPE NOT NUMERIC GO TO P-READ-2.
    IF WREC-TYPE > 02 GO TO P-READ-2.
    IF SW1 = 1 GO TO P-R4.
    MOVE 1 TO SW1.
P-STORE-R3.
    MOVE WINST-CODE TO CID-CODE.
P-R4.
    IF WINST-CODE NOT = CID-NO GO TO P-CHANGE-R3.
    IF WREC-TYPE NOT = 01 GO TO P-RECORD-2.

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    PERFORM P-PREP-QUAL THRU P-QUAL-EXIT.
    GO TO P-READ-2.
P-RECORD-2.
    IF WREC-TYPE NOT = 02 GO TO P-READ-2.
    PERFORM P-PREP-LINE1 THRU P-PREP-EXIT.
    GO TO P-READ-2.
P-CHANGE-R3.
    GO TO P-STORE-R3.
P-HEAD.
    IF LCT-1 > 0 GO TO P-HEAD-EXIT.
    ADD 1 TO PAGECT.
    MOVE PAGECT TO H1PAGE.
    WRITE LP-REC      FROM HEAD1 AFTER NEWPAGE.
    WRITE LP-REC      FROM HEAD2 AFTER 1.
    WRITE LP-REC      FROM HEAD3 AFTER 2.
    WRITE LP-REC      FROM HEAD4 AFTER 1.
    WRITE LP-REC      FROM HEAD5A AFTER 2.
    WRITE LP-REC      FROM HEAD6 AFTER 2.
    WRITE LP-REC      FROM HEAD7 AFTER 1.
    MOVE 50 TO LCT-1.
P-HEAD-EXIT.
    EXIT.
P-HEAD8.
    MOVE YEAR-C TO H8YEAR1.
    MOVE YR-C   TO H8YEAR2.
    WRITE LP-REC FROM HEAD8 AFTER 2.
    ADD 1 TO YEAR-C.
    ADD 1 TO YR-C.
P-H8-EXIT.
    EXIT.
P-PREP-QUAL.
    EXAMINE WQUAL REPLACING ALL SPACES BY ZEROS.
    MOVE 1 TO LCT CTR-2.
P-LOOP.
    IF QUAL-1 (LCT) NOT = '00' GO TO P-LOOP-C.
    ADD 1 TO LCT.
    IF LCT > 05 GO TO P-QUAL-EXIT.
    GO TO P-LOOP.
P-LOOP-C.
    MOVE QUAL-1 (LCT) TO SQUAL.
    MOVE QUAL-DEGREE (SQUAL) TO QUAL-1 (CTR-2).
    ADD 1 TO CTR-2 LCT.
    IF LCT > 5 GO TO P-QUAL-EXIT.
    GO TO P-LOOP.
P-QJAL-EXIT.
    EXIT.
P-PREP-LINE1.
    MOVE CID-CODE TO L1-CODE.
    MOVE TMODE (CID-NO) TO CTR.
    MOVE TINST-NM (CTR) TO L1-INST.
    EXAMINE WPHD-1 (10) REPLACING ALL SPACES BY ZEROS.
    EXAMINE WMSC-1 (10) REPLACING ALL SPACES BY ZEROS.
    EXAMINE WBSC-1 (10) REPLACING ALL SPACES BY ZEROS.
    MOVE WPHD-YEARS (10) TO L1PHD.
    MOVE WMSC-YEARS (10) TO L1MSC.
    MOVE WBSC-YEARS (10) TO L1BSC.
    ADD WPHD-YEARS (10)
      WMSC-YEARS (10)
      WBSC-YEARS (10) GIVING RJ-TOT.
    MOVE RJ-TOT TO L1TOT-1.
    EXAMINE FILLER4 REPLACING ALL SPACES BY ZEROS.
    ADD WSEN-TECH WTECH GIVING TJ-TOT.
    MOVE WTECHN TO TA-TOT.
    ADD TO-TOT TA-TOT GIVING TOTAL-A.
    ADD WEXEC WCLER WARTSAN GIVING OTHER-TOT-A.

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MOVE WJNSKIL TO OTHER-TOT-U.
ADD OTHER-TOT-A OTHER-TOT-U GIVING OTHER-TOT-T.
MOVE TO-TOT TO LITECH.
MOVE TA-TOT TO LITECHN.
MOVE TOTAL-A TO LITOT-TS.
MOVE OTHER-TOT-A TO LIOSUP-A.
MOVE OTHER-TOT-U TO LIOSUP-U.
MOVE OTHER-TOT-T TO LIOSUP-T.
ADD RO-TOT TOTAL-A OTHER-TOT-T GIVING TOTAL-STAFF.
MOVE TOTAL-STAFF TO LITOTAL.
PERFORM P-HEAD THRU P-HEAD-EXIT.
WRITE LP-REC FROM LINE1 AFTER 2.
MOVE SPACES TO LINE1.
SUBTRACT 2 FROM LCT-1.
P-PREP-EXIT.
EXIT.
P-GTOT.
ADD WPHD-YEARS (10) TO GTOT-PHD.
ADD WMSC-YEARS (10) TO GTOT-MS.
ADD WBSY-YEARS (10) TO GTOT-BSC.
ADD RO-TOT TO GTOT-RO.
ADD TO-TOT TO GTOT-TO.
ADD TA-TOT TO GTOT-TA.
ADD TOTAL-A TO GTOT-TS.
ADD OTHER-TOT-A TO GTOT-OTHER-A.
ADD OTHER-TOT-U TO GTOT-OTHER-U.
ADD OTHER-TOT-T TO GTOT-OTHER-T.
ADD TOTAL-STAFF TO GTOT-STAFF.
P-GTOT-EXIT.
EXIT.
P-TOTAL.
MOVE SPACES TO LINE1.
MOVE GTOT-PHD TO L1PHD.
MOVE GTOT-MS TO L1MSC.
MOVE GTOT-BSC TO L1BSC.
MOVE GTOT-RO TO L1TOT-1.
MOVE GTOT-TO TO LITECH.
MOVE GTOT-TA TO LITECHN.
MOVE GTOT-TS TO L1TOT-TS.
MOVE GTOT-OTHER-A TO L1OSUP-A.
MOVE GTOT-OTHER-U TO L1OSUP-U.
MOVE GTOT-OTHER-T TO L1OSUP-T.
MOVE GTOT-STAFF TO L1TOTAL.
WRITE LP-REC FROM LINE1 AFTER 2.
MOVE SPACES TO LINE1.
MOVE ZEROS TO GRAND-TOTALS.
*
P-TOTAL-EXIT.
EXIT.
P-AVERAGE.
MOVE ' AVERAGE NO. P.A. ' TO LINE12.
MOVE ALL ' ' TO
L1PHD-X
L1MSC-X
L1BSC-X
L1TOT-A-X
LITECH-X
LITECHN-X
L1TOT-TS-X
L1OSUP-A-X
L1OSUP-U-X
L1OSUP-T-X
L1TOTAL-X.
WRITE LP-REC FROM LINE1 AFTER 2.
MOVE SPACES TO LINE1.
P-AVG-EXIT.

```

```
        EXIT.  
P-CLOSE-2.  
*  
        CLOSE DATAFILE.  
        STOP RUN.  
/*  
// LBLTYP TAPE  
// EXEC LNKEOT  
/*  
/&  
* && EOJ
```

(iii) PROGRAM RAARP02

(a) Program Description

3.46 This program produces table 02 which shows the utilization of Financial Resources in Research Institutions. The program reads two input files viz- the sorted main data file RAARDATA-ST06 and the institution dictionary file, RAARINST, and extracts record types 03 and 05 from the main data file. All other records are skipped.

3.47 INPUT

(1) Sorted main data file on magnetic tape, Labelled 'RAARDATA-ST06'
(see 2.21 through 2.34)

(2) Institution dictionary file on Diskette Labelled 'RAARINST' (see
2.36)

(3) Parameter card for commencement year of survey.

OUTPUT

PRINTOUT:- TABLE 02 entitled 'Financial Resources in Research
Institutions' (see Appendices II, III)

Record types selected:- 03 and 05

(b) Program Procedure

3.48 First the program reads the institution dictionary file from a diskette which is input as a card file and stores the institution name and code into a table in working storage.

The program also stores a modifier for each record for subsequent retrieval of the stored data on institution name and code, using direct subscripting method.

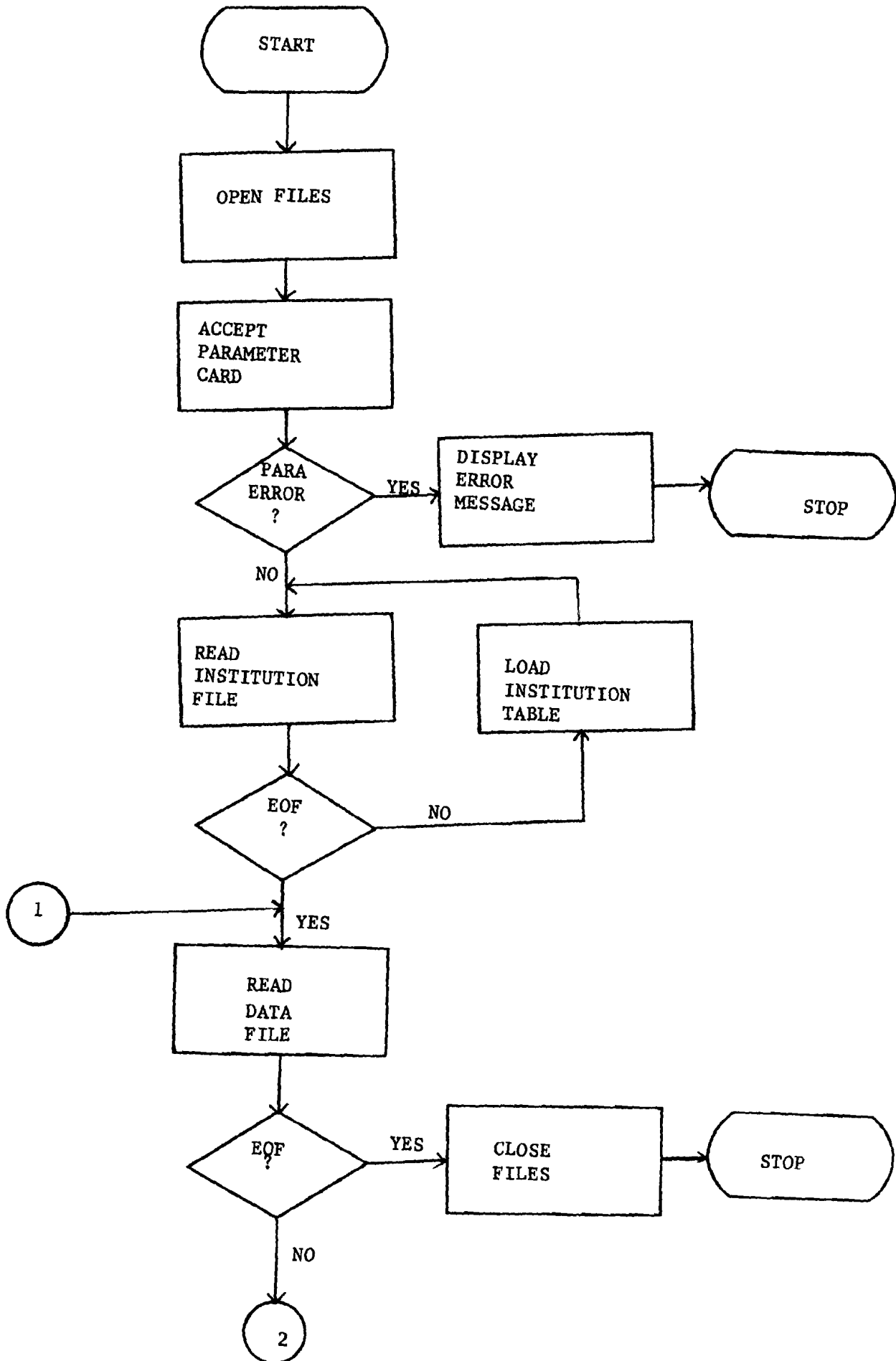
At the end of this file, the program proceeds to read the sorted RAARDATA-ST06 file and extracts record types 03 and 05.

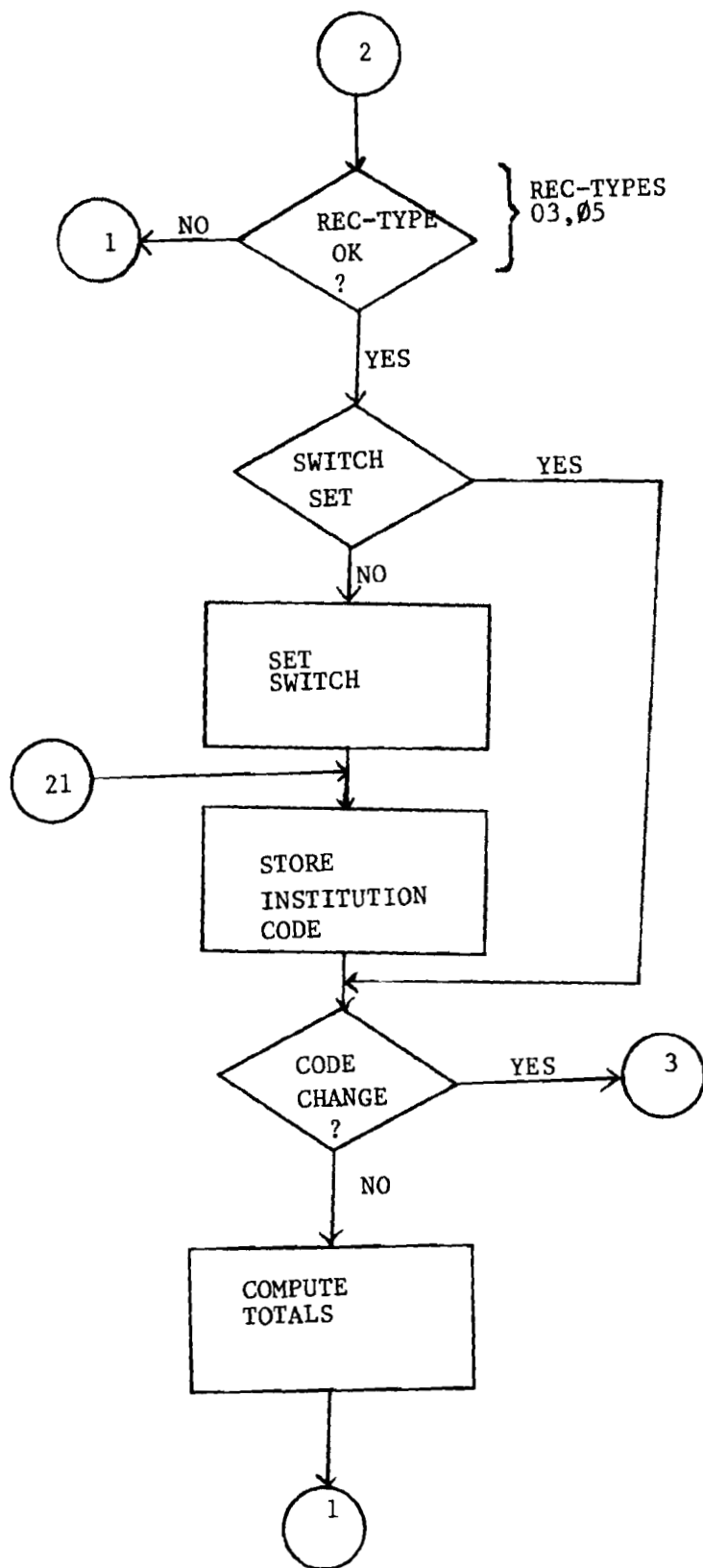
Record type 03 contains figures on recurrent and development expenditure for a period of ten years, whereas Record type 05 contains information on technical aid for the latest financial year of the survey.

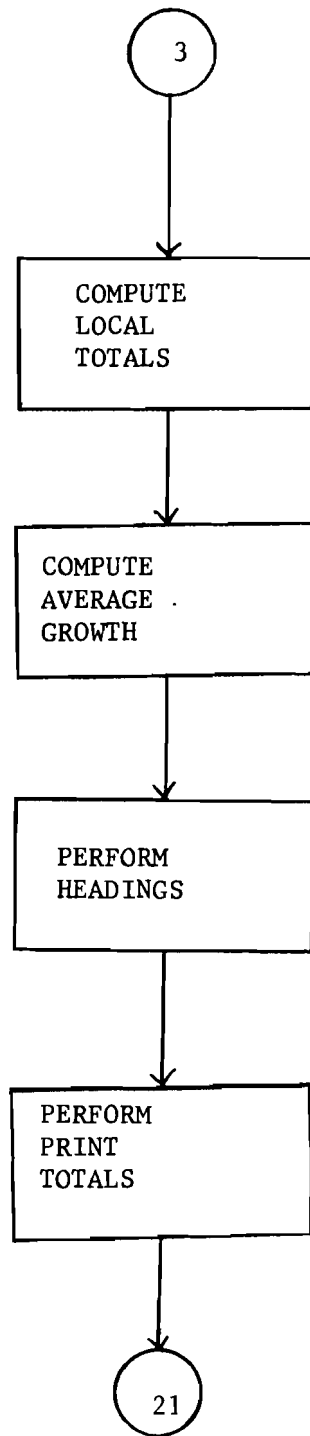
The information for one institution is accumulated in memory and printed after calculating the average growth for each column. Dashes are printed for unavailable information.

The table shows the distribution of financial resources for the 10 years 1970/71 to 1979/80 under review. A data parameter card is used to give flexibility to regulate the period covered by the survey at a later date. For more details see the following listing and program flowchart

(c) PROGRAM FLOWCHART - RAARP02







(d) PROGRAM LISTING - RAARP02

```
* ## JCB JNM=RAARP02,CLASS=A,USER=DPS04000
// JCB RAARP02 REPORT 02
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP02,*
// EXEC FCDBDL,SIZE=54<
CBL NJSEQ,CLIST,SKREF,FLDW=30,STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP02.
    AUTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES. COL IS NEWPAGE SYSIPT IS CREADER.
    INPUT-OUTPUT SECTION.
    FILE-CONTROL.
      SELECT INST-FILE ASSIGN TO SYS025-UR-2501-S.
      SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
      SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S.
    DATA DIVISION.
    FILE SECTION.
      FD INST-FILE RECORDING MODE IS F
        LABEL RECORDS OMITTED
        DATA RECORD IS INSTREC.
      *
      * VALUE OF ID IS 'RAARINST'.
      01 INSTREC.
        02 INST-CODE PIC 9(03).
        02 FILLER PIC X.
        02 INST-NM PIC X(63).
        02 FILLER PIC X(13).
      *
      FD DATAFILE RECORDING MODE IS F
        BLOCK CONTAINS 7000 CHARACTERS
        LABEL RECORDS ARE STANDARD
        DATA RECORD IS INREC.
      *
      * VALUE OF ID IS 'RAARDATA'.
      01 INREC.
        02 FILLER PIC X(140).
      *
      FD PRINT-FL
        LABEL RECORDS OMITTED
        DATA RECORD IS LP-REC.
      01 LP-REC.
        02 FILLER PIC X(133).
      *
    WORKING-STORAGE SECTION.
      77 SW1 PIC 9 VALUE 0.
      77 SW2 PIC 9 VALUE 0.
      77 PAGECT PIC 999 VALUE 0.
      77 CTR1 PIC 999 VALUE 0.
      77 CTR2 PIC 999 VALUE 0.
      77 CTR3 PIC 999 VALUE 0.
      77 YEAR1 PIC 9(04).
      77 YEAR2 PIC 99.
      01 PARA-CARD.
        02 P-CYEAR PIC X(04).
        02 PCYEAR REDEFINES P-CYEAR PIC 9(04).
        02 FILLER REDEFINES P-CYEAR.
          03 P-YR1 PIC 99.
          03 P-YR2 PIC 99.
        02 FILLER PIC X(75).
      01 TOTALS-REC.
        02 TOTAL-REC PIC 9(12) OCCURS 10.
```

```

01  TDTALS-DEV.
02  TOTAL-DEV          PIC 9(12)  OCCURS 10.
01  AID-TOTAL.
02  TOTAL-AID          PIC 9(12)  OCCURS 10.
01  TDTAL-LJCAL.
02  TOTAL-LJC          PIC 9(12)  OCCURS 10.
01  TDTAL-OVRALL.
02  TOTAL-OV           PIC 9(12)  OCCURS 10.
01  TDTAL-COMM.
02  TOT-CJM            PIC 9(12)  OCCURS 10.
01  AVERAGE-TDTALS.
02  REC-AVGE           PIC S9(12).
02  DEV-AVGE           PIC S9(12).
02  TOT-LJC-AV         PIC S9(12).
02  TOT-AID-AV         PIC S9(12).
02  OV-TOT-AV          PIC S9(12).
02  COM-TOT-AV-1       PIC S9(12).
02  CJM-TOT-AV-2       PIC S9(12).
01  STORE-REC.
02  INST-ID            PIC X(03).
02  INST-IDR REDEFINES INST-ID PIC 999.
02  WREC-AMT.
03  WAMT-1 PIC X(07) OCCURS 10.
02  WDEV-AMT.
03  WAMT-2 PIC X(07) OCCURS 10.
01  WORKREC.
02  INST-CODE-W        PIC X(03).
02  FILLER              PIC X(03).
02  REC-TYPE.
03  TYPE31             PIC 99.
03  TYPE32             PIC 9.
02  REC-DEV-AMT.
03  AMT-1 PIC 9(07) OCCURS 10.
02  FILLER              PIC X(61).
01  WORKREC-5 REDEFINES WORKREC.
02  FILLER              PIC X(08).
02  BUDG-YR1            PIC XX.
02  EXPD-1              PIC X(07).
02  EXPD11 REDEFINES EXPD-1 PIC 9(07).
02  BUDG-YR2            PIC XX.
02  EXPD-2              PIC X(07).
02  EXPD22 REDEFINES EXPD-2 PIC 9(07).
02  FILLER              PIC X(114).
01  INST-TABLE.
02  TCODE              PIC X(03) OCCURS 150.
02  TNAME              PIC X(63) OCCURS 150.
02  TMODE              PIC X(03) OCCURS 999.
01  LINE1.
02  FILLER              PIC X(03).
02  L1YEAR1            PIC X(04).
02  L1OBLIQUE          PIC X.
02  L1YEAR2            PIC XX.
02  FILLER              PIC X(15).
02  L1RECURR           PIC Z(9)9-.
02  L1-REC REDEFINES L1RECURR.
03  FILLER              PIC X(08).
03  L1-RECURR PIC XXX.
02  FILLER              PIC X(10).
02  L1DEVELP           PIC Z(9)9-.
02  L1-DEV REDEFINES L1DEVELP.
03  FILLER              PIC X(08).
03  L1-DEVELP PIC XXX.
02  FILLER              PIC X(09).
02  L1LOCF             PIC Z(9)9-.
02  L1-LJC REDEFINES L1LOCF.
03  FILLER              PIC X(08).

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```

03 LI-LOCF      PIC X(03).
02 FILLER      PIC X(08).
02 LIAID       PIC Z(9)9-.
02 LI-AIDS REDEFINES LIAID.
03 FILLER      PIC X(08).
03 LI-AID      PIC X(03).
02 FILLER      PIC X(10).
02 LIIOVERALL  PIC Z(11)9-.
02 LI-OVER REDEFINES LIIOVERALL.
03 FILLER      PIC X(10).
03 LI-OVERALL  PIC XXX.
02 FILLER      PIC X(14).
*
01 FILLER REDEFINES LINE1.
02 FILLER      PIC X(03).
02 LIIGROWTH  PIC X(19).
02 FILLER      PIC X(111).
01 HEAD1.
02 FILLER      PIC X(03)  VALUE SPACES.
02 HDATE      PIC X(08).
02 FILLER      PIC X(14)  VALUE SPACES.
02 FILLER      PIC X(55)  VALUE
'N A T I O N A L C O U N C I L F O R S C I E N C E'.
02 FILLER      PIC X(30)  VALUE
' A N D T E C H N O L O G Y'.
02 FILLER      PIC X(11)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'PAGE:'.
02 H1PAGE     PIC ZZ9.
02 FILLER      PIC X(04)  VALUE SPACES.
*
01 HEAD2.
02 FILLER      PIC X(46)  VALUE SPACES.
02 FILLER      PIC X(44)  VALUE
'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER      PIC X(43)  VALUE SPACES.
*
01 HEAD3.
02 FILLER      PIC X(12)  VALUE ' TABLE 02'.
02 FILLER      PIC X(34)  VALUE SPACES.
02 FILLER      PIC X(57)  VALUE
'FINANCIAL RESOURCES IN RESEARCH INSTITUTIONS-KENYA POUNDS'.
02 FILLER      PIC X(30)  VALUE SPACES.
*
01 HEAD4.
02 FILLER      PIC X(46)  VALUE SPACES.
02 FILLER      PIC X(57)  VALUE ALL '-'.
02 FILLER      PIC X(30)  VALUE SPACES.
*
01 HEAD5.
02 FILLER      PIC X(15)  VALUE SPACES.
02 FILLER      PIC X(25)  VALUE
'INSTITUTION CODE & NAME:-'.
02 FILLER      PIC XX    VALUE SPACES.
02 H5-CODE     PIC XXX.
02 FILLER      PIC XX    VALUE SPACES.
02 H5NAME      PIC X(63).
02 FILLER      PIC X(22)  VALUE SPACES.
*
01 HEAD6.
02 FILLER      PIC X(11)  VALUE ' YEAR '.
02 FILLER      PIC X(15)  VALUE SPACES.
02 FILLER      PIC X(09)  VALUE 'RECURRENT'.
02 FILLER      PIC X(11)  VALUE SPACES.
02 FILLER      PIC X(11)  VALUE 'DEVELOPMENT'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(17)  VALUE 'TOTAL LOCAL FUNDS'.

```

```

02 FILLER      PIC X(13)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE 'AID'.
02 FILLER      PIC X(10)  VALUE SPACES.
02 FILLER      PIC X(13)  VALUE 'OVERALL TOTAL'.
02 FILLER      PIC X(15)  VALUE SPACES.

```

*

01 HEAD7.

```

02 FILLER      PIC X(11)  VALUE ' ---- '.
02 FILLER      PIC X(15)  VALUE SPACES.
02 FILLER      PIC X(09)  VALUE ALL '-'.
02 FILLER      PIC X(11)  VALUE SPACES.
02 FILLER      PIC X(11)  VALUE ALL '-'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(17)  VALUE ALL '-'.
02 FILLER      PIC X(13)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE ALL '-'.
02 FILLER      PIC X(10)  VALUE SPACES.
02 FILLER      PIC X(13)  VALUE ALL '-'.
02 FILLER      PIC X(15)  VALUE SPACES.

```

*

01 HEAD8.

```

02 FILLER      PIC X(03)  VALUE SPACES.
02 H8YEAR-1    PIC X(04).
02 H8JBLIQUE   PIC X      VALUE '/'.
02 H8YEAR-2    PIC XX.
02 FILLER      PIC X(16)  VALUE SPACES.
02 FILLER      PIC X(10)  VALUE ALL '-'.
02 FILLER      PIC X(10)  VALUE SPACES.
02 FILLER      PIC X(10)  VALUE ALL '-'.
02 FILLER      PIC X(10)  VALUE SPACES.
02 FILLER      PIC X(10)  VALUE ALL '-'.
02 FILLER      PIC X(10)  VALUE SPACES.
02 FILLER      PIC X(10)  VALUE ALL '-'.
02 FILLER      PIC X(10)  VALUE SPACES.
02 FILLER      PIC X(12)  VALUE ALL '-'.
02 FILLER      PIC X(15)  VALUE SPACES.

```

*

01 HEAD9.

```

02 FILLER      PIC X(03)  VALUE SPACES.
02 FILLER      PIC X(21)  VALUE 'AVERAGE % GROWTH P.A.'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE ALL '-'.
02 FILLER      PIC X(17)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE ALL '-'.
02 FILLER      PIC X(17)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE ALL '-'.
02 FILLER      PIC X(17)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE ALL '-'.
02 FILLER      PIC X(17)  VALUE SPACES.
02 FILLER      PIC X(03)  VALUE ALL '-'.
02 FILLER      PIC X(21)  VALUE SPACES.

```

01 HEAD10.

```

02 FILLER      PIC X(25)  VALUE SPACES.
02 FILLER      PIC X(05)  VALUE 'NOTE:'.
02 FILLER      PIC X(04)  VALUE SPACES.
02 FILLER      PIC X(31)  VALUE
    '---- = INFORMATION NOT AVAILABLE'.
02 FILLER      PIC X(68)  VALUE SPACES.

```

*

PROCEDURE DIVISION.

P-START.

```

    OPEN INPUT INST-FILE
        DATAFILE
        OUTPUT PRINT-FL.
    MOVE CURRENT-DATE TO H1DATE.
    MOVE SPACES TO INST-TABLE LINE1.

```

```

      MOVE ZEROS TO TOTALS-REC
      TOTALS-DEV
      AID-TOTAL
      TOTAL-LOCAL
      TOTAL-OVRALL
      TOTAL-COMM
      AVERAGE-TOTALS.

      MOVE 1 TO CTRL.
      ACCEPT PARA-CARD FROM CREADER.
      IF P-CYEAR NOT NUMERIC
          DISPLAY 'PARAMETER ERRJR' PARA-CARD
          DISPLAY 'RJN ABANDONED' STOP RUN.
      MOVE PCYEAR TO YEAR1.
      MOVE P-YR2 TO YEAR2.
      ADD 1 TO YEAR2.

*
      P-READ-1.
      READ INST-FILE AT END GO TO P-CLOSE1.
      IF CTRL > 150 GO TO P-HALT.
      MOVE INST-CODE TO TCODE (CTRL).
      MOVE INST-NM TO TNAME (CTRL).
      MOVE CTRL TO TMODE (INST-CODE).
      ADD 1 TO CTRL.
      GO TO P-READ-1.

      P-HALT.
      DISPLAY 'TABLE OVERFLOW'.
      STOP RUN.

      P-CLOSE1.
      CLOSE INST-FILE.

*
      P-READ-2.
      READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE2.
      IF REC-TYPE NOT NUMERIC GO TO P-READ-2.
      IF TYPE31 = 03 OR
          TYPE31 = 05 NEXT SENTENCE
      ELSE GO TO P-READ-2.
      IF SW1 = 1 GO TO P-COMPARE.
      MOVE 1 TO SW1.

*
      P-STORE-ID.
      MOVE INST-CODE-W TO INST-ID.

      P-COMPARE.
      IF INST-CODE-W NOT = INST-ID GO TO P-CHANGE-ID.
      IF TYPE31 = 05 GO TO P-RECORD-5.

*
      RECD TYPE = 03 *****
      IF TYPE32 = 1 MOVE REC-DEV-AMT TO WREC-AMT ELSE
          MOVE REC-DEV-AMT TO WDEV-AMT.
      EXAMINE REC-DEV-AMT REPLACING ALL SPACES BY ZEROS.
      PERFORM P-ADD-D3 THRU P-REC-03-EXIT.

*
      GO TO P-READ-2.

      P-RECORD-5.
      EXAMINE EXPD-1 REPLACING ALL SPACES BY ZEROS.
      EXAMINE EXPD-2 REPLACING ALL SPACES BY ZEROS.
      ADD EXPD11 TO TOTAL-AID (10).
      ADD EXPD22 TO TOTAL-AID (10).
      GO TO P-READ-2.

      P-CHANGE-ID.
      PERFORM P-HEAD THRU P-HEAD-EXIT.
      PERFORM P-LOCAL-TOT THRU P-LOCAL-TOT-EXIT.
      PERFORM P-JV-TOT THRU P-OV-TOT-EXIT.

*
      CALCULATE AVERAGES*****
      MOVE TOTALS-REC TO TOTAL-COMM.
      PERFORM P-CALC-AVGE THRU P-CALC-EXIT.
      MOVE COM-TOT-AV-2 TO REC-AVGE.

*

```

```

      MOVE TOTALS-DEV TO TOTAL-COMM.
      PERFORM P-CALC-AVGE THRU P-CALC-EXIT.
      MOVE COM-TOT-AV-2 TO DEV-AVGE.
*
      MOVE AID-TOTAL TO TOTAL-COMM.
      PERFORM P-CALC-AVGE THRU P-CALC-EXIT.
      MOVE COM-TOT-AV-2 TO TOT-AID-AV.
      MOVE TOTAL-LOCAL TO TOTAL-COMM.
      PERFORM P-CALC-AVGE THRU P-CALC-EXIT.
      MOVE COM-TOT-AV-2 TO TOT-LDC-AV.
*
      MOVE TOTAL-OVRALL TO TOTAL-COMM.
      PERFORM P-CALC-AVGE THRU P-CALC-EXIT.
      MOVE COM-TOT-AV-2 TO OV-TOT-AV.
*
      PERFORM P-PRINT THRU P-PRINT-EXIT.
      PERFORM P-GROWTH THRU P-GROWTH-EXIT.
*
      PERFORM P-PRINT-HEAD9 THRU P-HEAD9-EXIT.
      WRITE LP-REC FROM HEAD10 AFTER 3.
      MOVE ZEROS TO TOTALS-REC
                      TOTALS-DEV
                      TOTAL-LOCAL
                      AID-TOTAL
                      TOTAL-OVRALL
                      AVERAGE-TOTALS.

P-PRT.
      GO TO P-STORE-ID.
P-ADD-03.
      MOVE 1 TO CTR2.
P-ADD-LOOP.
      IF CTR2 > 10 GO TO P-REC-03-EXIT.
      IF TYPE32 = 1 ADD AMT-1 (CTR2) TO TOTAL-REC (CTR2).
      IF TYPE32 = 2 ADD AMT-1 (CTR2) TO TOTAL-DEV (CTR2).
      ADD 1 TO CTR2.
      GO TO P-ADD-LOOP.
P-REC-03-EXIT.
      EXIT.
P-CALC-AVGE.
      MOVE 1 TO CTR1.
      MOVE 2 TO CTR2.
      MOVE ZEROS TO COM-TOT-AV-2 CTR3 SW2.
P-CALC-LOOP.
      IF SW2 = 1 GO TO P-CALC.
      IF CTR2 > 10 GO TO P-CALC-EXIT.
      IF TOT-COM (CTR1) NOT = 0 MOVE 1 TO SW2 ELSE
          ADD 1 TO CTR1 CTR2 GO TO P-CALC-LOOP.
P-CALC.
      ADD 1 TO CTR3.
      SUBTRACT TOT-COM (CTR1) FROM TOT-COM (CTR2)
          GIVING COM-TOT-AV-1.
      ADD COM-TOT-AV-1 TO COM-TOT-AV-2.
      IF CTR2 NOT = 10
          ADD 1 TO CTR1 CTR2
          GO TO P-CALC-LOOP.
*
      ADD 1 TO CTR3.
      DIVIDE CTR3 INTO COM-TOT-AV-2 ROUNDED.
P-CALC-EXIT.
      EXIT.
P-HEAD.
      ADD 1 TO PAGECT.
      MOVE PAGECT TO H1PAGE.
      WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
      WRITE LP-REC FROM HEAD2 AFTER 1.
      WRITE LP-REC FROM HEAD3 AFTER 2.
      WRITE LP-REC FROM HEAD4 AFTER 1.
      MOVE TMODE (INST-IDR) TO CTR2.

```

```

        MOVE TNAME (CTR2)      TO H5NAME.
        MOVE INST-ID           TO H5-CODE.
        WRITE LP-REC FROM HEAD5 AFTER 2.
        WRITE LP-REC FROM HEAD6 AFTER 2.
        WRITE LP-REC FROM HEAD7 AFTER 1.
P-HEAD-EXIT.
        EXIT.
*
P-PRINT.
        MOVE PCYEAR            TO YEAR1.
        MOVE P-YR2             TO YEAR2.
        ADD 1 TO YEAR2.
        MOVE 1                 TO CTR1.
P-PRINT-LOOP.
        MOVE YEAR1             TO LIYEAR1.
        MOVE '/'               TO LIOBLIQUE.
        MOVE YEAR2             TO LIYEAR2.
        IF TOTAL-REC (CTR1) = 0
                                MOVE '---' TO L1-RECURR
        ELSE
            MOVE TOTAL-REC (CTR1) TO LIRECURR.
        IF TOTAL-DEV (CTR1) = 0
                                MOVE '---' TO L1-DEVELP
        ELSE
            MOVE TOTAL-DEV (CTR1) TO LIDEVELP.
        IF TOTAL-LOC (CTR1) = 0 MOVE '---' TO L1-LOCF ELSE
        MOVE TOTAL-LOC (CTR1) TO L1LOCF.
        IF TOTAL-AID (CTR1) = 0 MOVE '---' TO L1-AID ELSE
        MOVE TOTAL-AID (CTR1) TO L1AID.
        IF TOTAL-OV (CTR1) = 0 MOVE '---' TO L1-OVERALL ELSE
        MOVE TOTAL-OV (CTR1) TO L1OVERALL.
        WRITE LP-REC FROM LINE1 AFTER 2.
        MOVE SPACES TO LINE1.
        IF CTR1 NOT = 10
            ADD 1 TO CTR1 YEAR1 YEAR2
            GO TO P-PRINT-LOOP.
P-PRINT-EXIT.
        EXIT.
P-GROWTH.
        MOVE 'AVERAGE GROWTH P.A.' TO L1GROWTH.
        MOVE REC-AVGE TO LIRECURR.
        MOVE DEV-AVGE TO LIDEVELP.
        MOVE TOT-LOC-AV TO L1LOCF.
        MOVE TOT-AID-AV TO L1AID.
        MOVE OV-TOT-AV TO L1OVERALL.
        WRITE LP-REC FROM LINE1 AFTER 2.
        MOVE SPACES TO LINE1.
P-GROWTH-EXIT.
        EXIT.
*
*
P-PRINT-HEAD9.
        WRITE LP-REC FROM HEAD9 AFTER 2.
P-HEAD9-EXIT.
        EXIT.
P-LJCAL-TOT.
        MOVE 1 TO CTR1.
P-LJCAL-LOOP.
        ADD TOTAL-REC (CTR1) TOTAL-DEV (CTR1)
            GIVING TOTAL-LOC (CTR1).
        IF CTR1 NOT = 10
            ADD 1 TO CTR1
            GO TO P-LJCAL-LOOP.
P-LJCAL-TOT-EXIT.
        EXIT.
P-OV-TOT.

```

```

        MOVE 1 TO CTR1.
P-OV-LOOP.
        ADD TOTAL-LOC (CTR1) TOTAL-AID (CTR1)
            GIVING TOTAL-OV (CTR1).
        IF CTR1 NOT = 10
            ADD 1 TO CTR1
            GO TO P-OV-LOOP.
P-OV-TOT-EXIT.
        EXIT
*
P-CLOSE2.
        PERFORM P-CHANGE-ID.
        CLOSE DATAFILE
            PRINT-FL.
        STOP RUN.
/*
// L3LTYP TAPE
// EXEC LNKEDT
/*
* 88 E0J

```


(iv) PROGRAM RAARP03

(a) Program Description

3.49 This program reads two input files viz:- the sorted main data file RAARDATA-STØ7 and institution dictionary file RAARINST. It then extracts record types types 01, 02,04, and 05 and produces table 03 showing the distribution of personnel and operating costs for each institution.

- 3.50 Input (1) Sorted main data file on magnetic tape labelled RAARDATA-STØ7 (see 2.21 through 2.34)
- (2) Institution file on diskette labelled RAARINST (see 2.36)
- (3) Parameter card - latest date of survey

Output - Printout - TABLE 03 entitled

'Distribution of Resources in Research Institutions as at
31st December 19'. (see Appendices II, III)

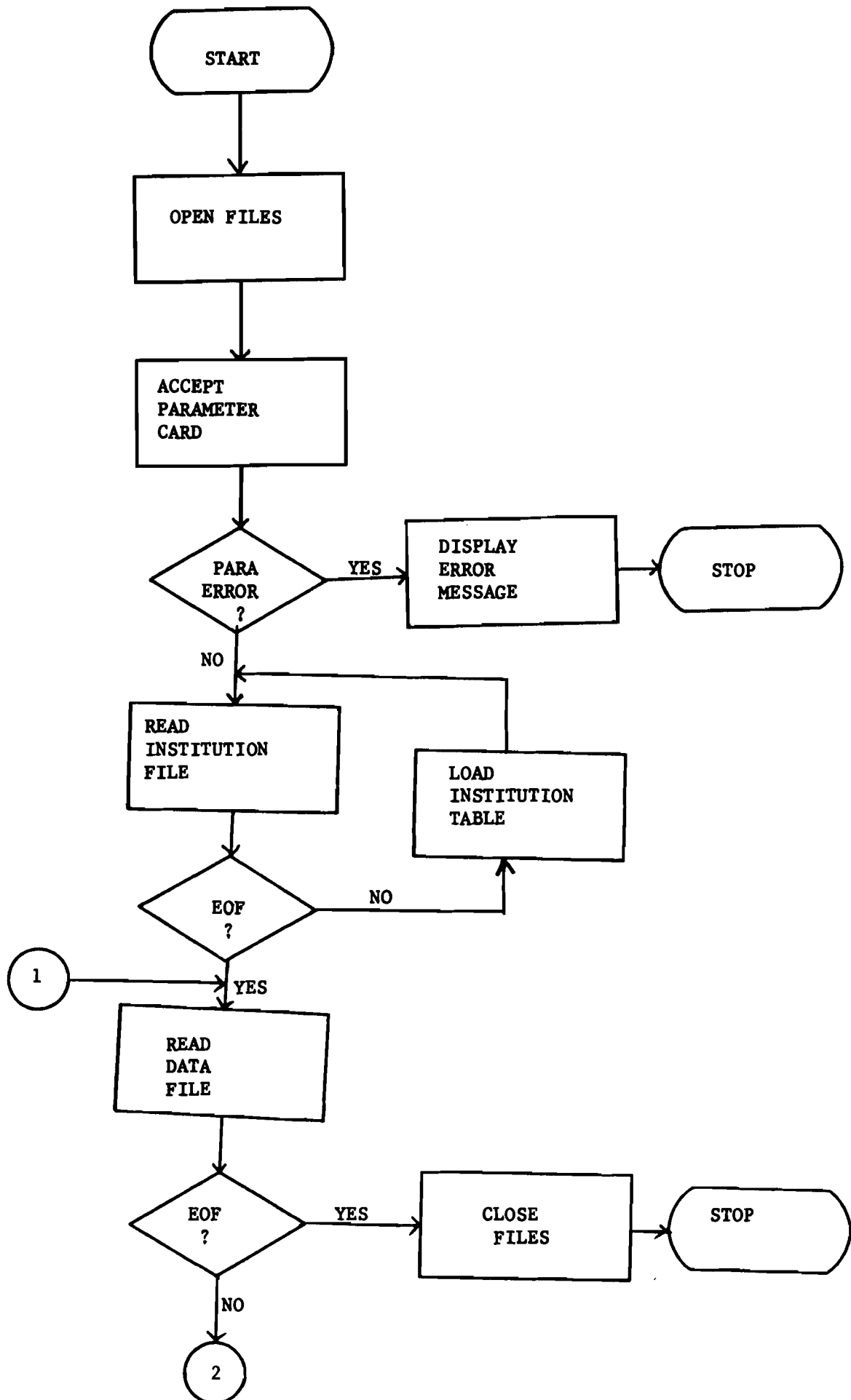
Records Selected: 01, 02, 04, & 05

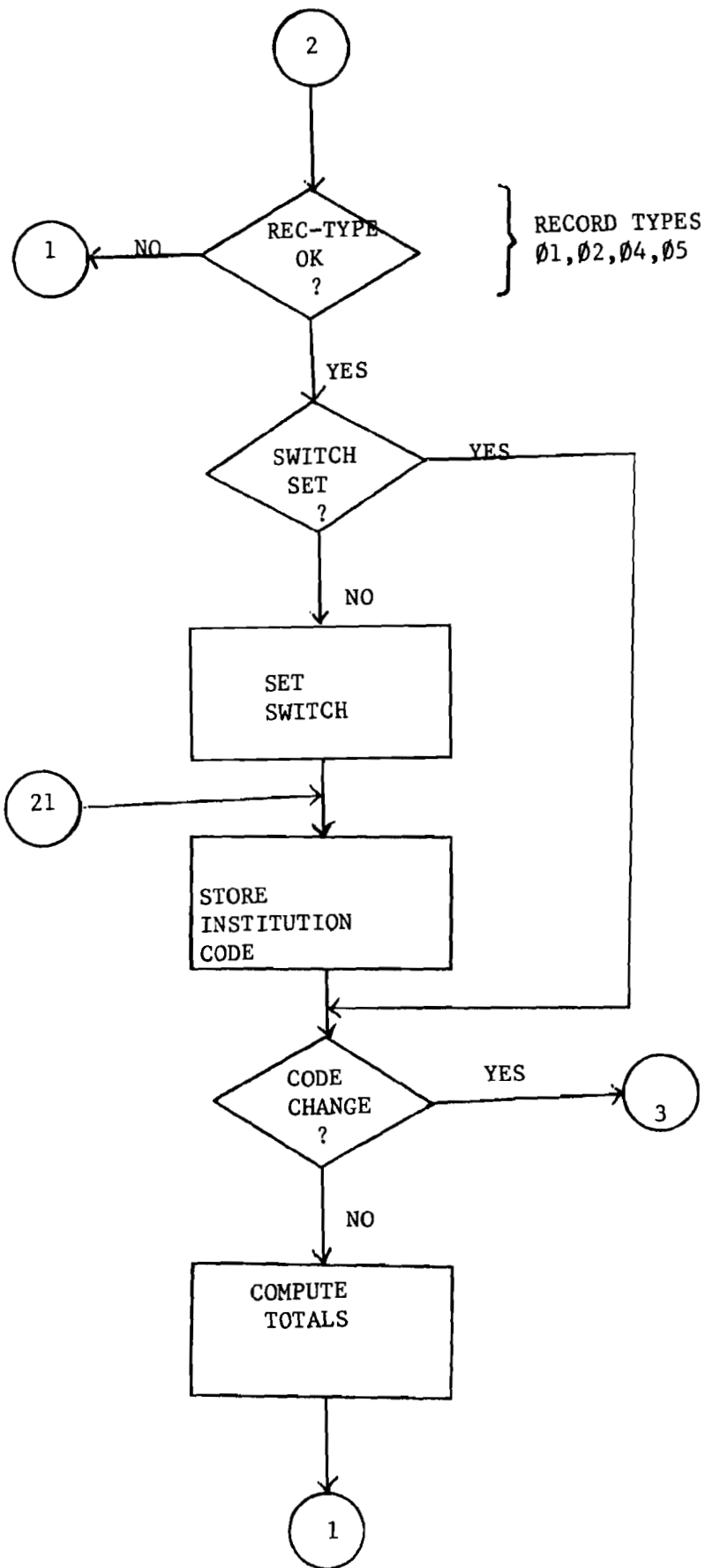
(b) Program Procedure

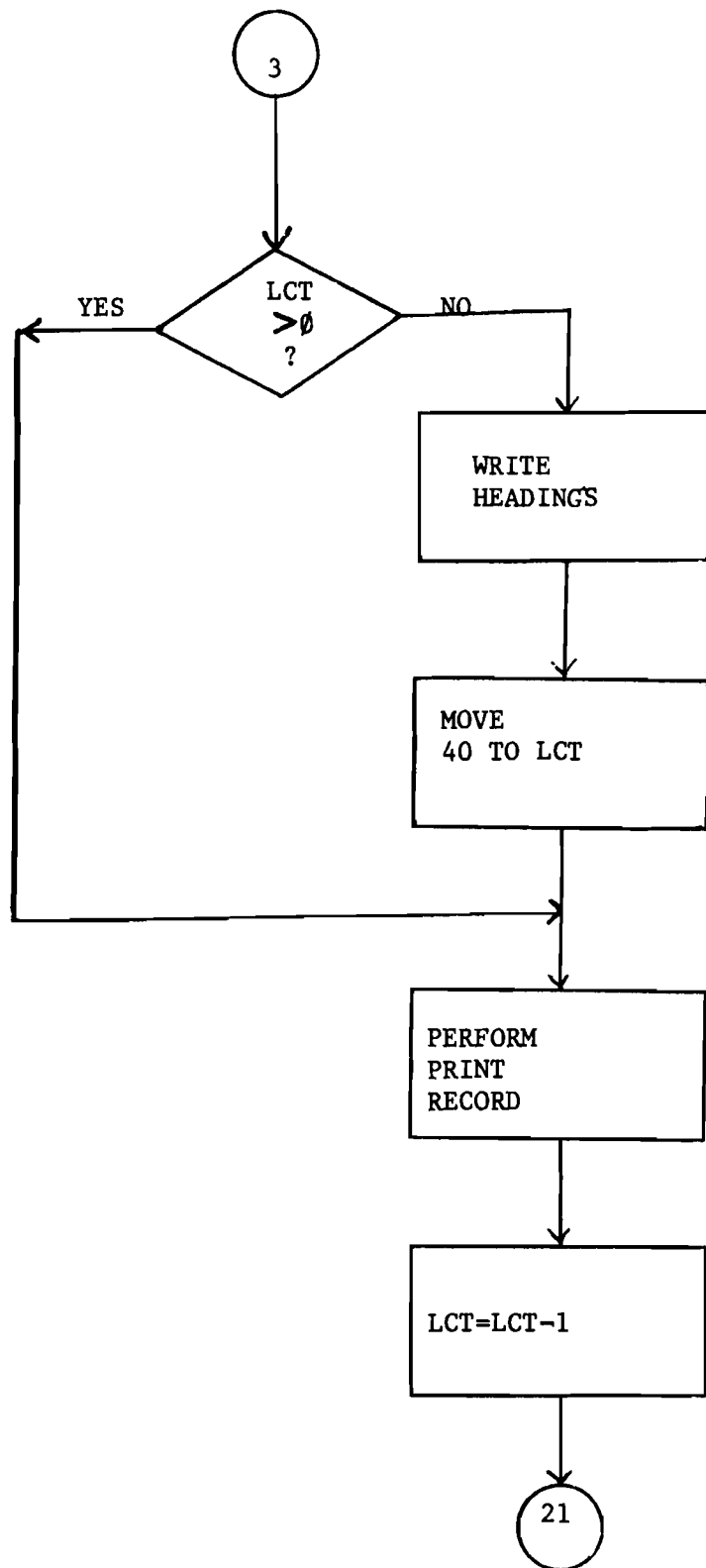
3.51 Initially, the program reads the institution dictionary file RAARINT and constructs a table in working storage containing Institution name and code. The program also stores the modifier for each record for subsequent retrieval of the stored data on institution name and code using direct subscripting method.

Then the program reads the sorted main data file RAARDATA-STØ7 and extracts record types 01,02,04 & 05. All other records are skipped. The program picks ecozone from record type 01, personnel from record type 02,institutional costs from records types 04 and 05.

By adding up the personnel and operating costs, and the total number of research and Technical staff, the program prints the accumulated figures when the institution code changes. (see program listing and flowchart that follow).







(d) PROGRAM LISTING - RAARP03

```
* ## JJB JNM=RAARP03,CLASS=A,USER=DPS04000
// JJB RAARP03
// LIBDEF CL,TO=USRCL2
// OPTION CATAL
  PHASE RAARP03,*
// EXEC FCDBDL,SIZE=54<
CBL NJSEQ,CLIST,SXREF,FLOW=STATE
  IDENTIFICATION DIVISION.
  PROGRAM-ID. RAARP03.
  AUTHOR. CKC, AWK, AMK, NKM.
  ENVIRONMENT DIVISION.
  CONFIGURATION SECTION.
  SOURCE-COMPUTER. IBM-370.
  OBJECT-COMPUTER. IBM-370.
  SPECIAL-NAMES. COL IS NEWPAGE
                  SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
    SELECT INST-FILE ASSIGN TO SYS025-UR-2501-S.
    SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S.
  DATA DIVISION.
  FILE SECTION.
  FD DATAFILE RECORDING MODE IS F
    BLOCK CONTAINS 7000 CHARACTERS
    LABEL RECORDS ARE STANDARD
    DATA RECORD IS INREC.
  * VALJE OF ID IS 'RAARDATA'.
  01 INREC.
    02 FILLER PIC X(140).
  FD INST-FILE RECORDING MODE IS F
    LABEL RECORDS ARE OMITTED
    DATA RECORDS IS INST-REC.
  * VALJE OF ID IS 'RAARINST'.
  01 INST-REC.
    02 INST-CODE PIC 9(03).
    02 FILLER PIC X.
    02 INST-NAME PIC X(63).
    02 FILLER PIC X(13).
  *
  FD PRINT-FL RECORDING MODE IS F
    LABEL RECORDS ARE OMITTED
    DATA RECORDS IS LP-REC.
  01 LP-REC.
    02 FILLER PIC X(133).
  WORKING-STORAGE SECTION.
  77 SW1 PIC 9 VALUE 0.
  77 LCT PIC 999 VALUE 0.
  77 PAGECT PIC 999 VALUE 0.
  77 CTR1 PIC 999 VALUE 0.
  77 CTR2 PIC 999 VALUE 0.
  77 SQUAL PIC 99 VALUE 0.
  77 WZONE PIC X VALUE SPACES.
  01 PARA-CARD.
    02 P-DATE PIC X(15).
    02 FILLER PIC X(65).
  *
  01 INST-CODE-S.
    02 ID-CODE-S PIC X(03).
    02 ID-NO-S REDEFINES ID-CODE-S PIC 999.
  01 INST-TABLE.
    02 TINST-CODE PIC X(03) OCCURS 150.
    02 TINST-NM PIC X(63) OCCURS 150.
    02 TMODE PIC X(03) OCCURS 999.
  01 TOTALS-A.
```

```

02 TDT-RJS          PIC 9(06).
02 TDT-TEC          PIC 9(06).
02 TDT-PE           PIC 9(08).
02 TDT-OPER         PIC 9(08).
02 TOTAL-1          PIC 9(08).
01 WORKREC.
02 FILLER           PIC X(46).
02 ECOZONE1         PIC X.
02 FILLER           PIC X(05).
02 ECOZONE2         PIC X.
02 FILLER           PIC X(05).
02 ECOZONE3         PIC X.
02 FILLER           PIC X(05).
02 ECOZONE4         PIC X.
02 FILLER           PIC X(05).
02 ECOZONE5         PIC X.
02 FILLER           PIC X(05).
02 ECOZONE6         PIC X.
02 FILLER           PIC X(05).
02 ECOZONE7         PIC X.
02 FILLER           PIC X(57).
*
01 WORKREC-02 REDEFINES WORKREC.
02 WINST-CODE       PIC X(03).
02 FILLER           PIC X(03).
02 WREC-TYPE.
03 REC-TYPE        PIC 99.
02 FILLER           PIC X(18).
02 WPHD-NO          PIC XX.
02 PHD-NO REDEFINES WPHD-NO PIC 99.
02 FILLER           PIC X(18).
02 WMSC-NO          PIC XX.
02 MSC-NO REDEFINES WMSC-NO PIC 99.
02 FILLER           PIC X(18).
02 WBSC-NO          PIC XX.
02 BSC-NO REDEFINES WBSC-NO PIC 99.
02 WTECH-STAFF.
03 WSEN-TECHNO     PIC 99.
03 WTECHNO         PIC 99.
03 WTECHNI         PIC 99.
02 WSUPPORT.
03 WEXECJT         PIC 99.
03 WCLERK          PIC 99.
03 WEXECJT         PIC 99.
03 WEXECUT         PIC 99.
03 WCLERK          PIC 99.
03 WARTISAN        PIC 99.
03 WUNSKIL         PIC 999.
02 FILLER           PIC X(57).
*
01 WORKREC-04 REDEFINES WORKREC.
02 FILLER           PIC X(08).
02 RITEM-CJDE       PIC X(03).
02 FILLER           PIC X(09).
02 REXP.
03 RPRJVID         PIC 9(07).
03 RUSED           PIC 9(07).
02 FILLER           PIC X(105).
01 WORKREC-05 REDEFINES WORKREC-04.
02 FILLER           PIC X(08).
02 BUDG-YR1         PIC XX.
02 EXP-1           PIC X(07).
02 EXPD11 REDEFINES EXP-1 PIC 9(07).
02 BUDG-YR2         PIC XX.
02 EXP-2           PIC X(07).
02 EXPD22 REDEFINES EXP-2 PIC 9(07).

```

```

01 02 FILLER          PIC X(114).
    LINE1.
    02 FILLER          PIC X(03).
    02 L1-CODE          PIC X(03).
    02 FILLER          PIC X(02).
    02 L1-NAME          PIC X(30).
    02 FILLER          PIC X(07).
    02 L1-ZONE          PIC X.
    02 FILLER          PIC X(07).
    02 L1-RO            PIC ZZZ9.
    02 FILLER          PIC X(07).
    02 L1-TECH          PIC ZZZ9.
    02 FILLER          PIC X(07).
    02 L1-RO-RT        PIC ZZ9.
    02 FILLER          PIC X(02).
    02 L1-COLON        PIC X.
    02 FILLER          PIC X(02).
    02 L1-TEC-RT       PIC ZZ9.
    02 FILLER          PIC X(05).
    02 L1-EMOL         PIC Z(07)9.
    02 FILLER REDEFINES L1-EMOL.
        03 FILLER      PIC X(05).
        03 L1-EMOL-X   PIC X(03).
    02 FILLER          PIC X(05).
    02 L1-COST         PIC Z(07)9.
    02 FILLER REDEFINES L1-COST.
        03 FILLER      PIC X(05).
        03 L1-COST-X   PIC X(03).
    02 FILLER          PIC X(07).
    02 L1-PEFUND        PIC Z(07)9.
    02 FILLER REDEFINES L1-PEFUND.
        03 FILLER      PIC X(05).
        03 L1-PEFUND-X PIC X(03).
    02 FILLER          PIC X(06).

*
01 HEAD1.
    02 FILLER          PIC X(03) VALUE SPACES.
    02 HDATE           PIC X(08).
    02 FILLER          PIC X(14) VALUE SPACES.
    02 FILLER          PIC X(55) VALUE
        'N A T I O N A L   C O U N C I L   F O R   S C I E N C E'.
    02 FILLER          PIC X(30) VALUE
        '   A N D   T E C H N O L O G Y'.
    02 FILLER          PIC X(11) VALUE SPACES.
    02 FILLER          PIC X(05) VALUE 'PAGE:'.
    02 H1PAGE          PIC ZZ9.
    02 FILLER          PIC X(04) VALUE SPACES.

*
01 HEAD2.
    02 FILLER          PIC X(45) VALUE SPACES.
    02 FILLER          PIC X(45) VALUE
        'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH'.
    02 FILLER          PIC X(43) VALUE SPACES.

*
01 HEAD3.
    02 FILLER          PIC X(03) VALUE SPACES.
    02 FILLER          PIC X(09) VALUE 'TABLE 03'.
    02 FILLER          PIC X(23) VALUE SPACES.
    02 FILLER          PIC X(50) VALUE
        'DISTRIBUTION OF RESOURCES IN RESEARCH INSTITUTIONS'.
    02 FILLER          PIC X(07) VALUE 'AS AT '.
    02 H3DATE          PIC X(15).
    02 FILLER          PIC X(26) VALUE SPACES.

*
01 HEAD4.
    02 FILLER          PIC X(35) VALUE SPACES.

```

	02	FILLER	PIC X(72)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(26)	VALUE	
*	01	HEAD5.			
	02	FILLER	PIC X(03)	VALUE	SPACES.
	02	FILLER	PIC X(23)	VALUE	'INSTITUTION CODE & NAME'.
	02	FILLER	PIC X(35)	VALUE	SPACES.
	02	FILLER	PIC X(09)	VALUE	'TECHNICAL'.
	02	FILLER	PIC X(08)	VALUE	SPACES.
	02	FILLER	PIC X(05)	VALUE	'RATIO'.
	02	FILLER	PIC X(07)	VALUE	SPACES.
	02	FILLER	PIC X(08)	VALUE	'PERSONAL'.
	02	FILLER	PIC X(04)	VALUE	SPACES.
	02	FILLER	PIC X(11)	VALUE	'OPERATIONAL'.
	02	FILLER	PIC X(03)	VALUE	SPACES.
	02	FILLER	PIC X(11)	VALUE	'TOTAL PE,DC'.
	02	FILLER	PIC X(05)	VALUE	SPACES.
*	01	HEAD6.			
	02	FILLER	PIC X(03)	VALUE	SPACES.
	02	FILLER	PIC X(23)	VALUE	SPACES.
	02	FILLER	PIC X(16)	VALUE	SPACES.
	02	FILLER	PIC X(08)	VALUE	'ECO-ZONE'.
	02	FILLER	PIC X	VALUE	SPACES.
	02	FILLER	PIC X(08)	VALUE	'ND.R.O.'.
	02	FILLER	PIC X(05)	VALUE	SPACES.
	02	FILLER	PIC X(05)	VALUE	'STAFF'.
	02	FILLER	PIC X(06)	VALUE	SPACES.
	02	FILLER	PIC X(12)	VALUE	'R.O. : TECH.'.
	02	FILLER	PIC X(04)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	'EMOLUMENTS'.
	02	FILLER	PIC X(05)	VALUE	SPACES.
	02	FILLER	PIC X(05)	VALUE	'COSTS'.
	02	FILLER	PIC X(07)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	SPACES.
	02	FILLER	PIC X(05)	VALUE	SPACES.
*	01	HEAD7.			
	02	FILLER	PIC X(91)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	'K.POUNDS '.
	02	FILLER	PIC X(02)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	'K.POUNDS '.
	02	FILLER	PIC X(04)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	'K.POUNDS '.
	02	FILLER	PIC X(06)	VALUE	SPACES.
*	01	HEAD7A.			
	02	FILLER	PIC X(03)	VALUE	SPACES.
	02	FILLER	PIC X(23)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(16)	VALUE	SPACES.
	02	FILLER	PIC X(08)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X	VALUE	SPACES.
	02	FILLER	PIC X(08)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(05)	VALUE	SPACES.
	02	FILLER	PIC X(05)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(06)	VALUE	SPACES.
	02	FILLER	PIC X(12)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(04)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(02)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(04)	VALUE	SPACES.
	02	FILLER	PIC X(10)	VALUE	ALL '-'. SPACES.
	02	FILLER	PIC X(06)	VALUE	SPACES.
01	HEAD8.				
	02	FILLER	PIC X(25)	VALUE	SPACES.


```

02 FILLER      PIC X(05) VALUE 'NOTE:'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(31) VALUE
      '---- = INFORMATION NOT AVAILBLE'.
02 FILLER      PIC X(68) VALUE SPACES.

```

*

PROCEDURE DIVISION.

P-START.

```

      OPEN INPUT      DATAFILE
                      INST-FILE
      OUTPUT          PRINT-FL.
      MOVE SPACES TO LINE1 INST-TABLE.
      MOVE CURRENT-DATE TO HDATE.
      MOVE 1 TO CTR1.
      ACCEPT PARA-CARD FROM CREADER.
      MOVE P-DATE TO H3DATE.

```

P-READ-1.

```

      READ INST-FILE AT END GO TO P-CLOSE-1.
      IF CTR1 > 150 GO TO P-TABLE-FULL.
      MOVE INST-CODE TO TINST-CODE (CTR1).
      MOVE INST-NAME TO TINST-NAME (CTR1).
      MOVE CTR1 TO TMODE (INST-CODE).
      ADD 1 TO CTR1.
      GO TO P-READ-1.

```

*

P-TABLE-FULL.

```

      DISPLAY 'INSTITUTE TABLE FULL'.
      DISPLAY 'RUN ABANDONED'.
      STOP RUN.

```

*

P-CLOSE-1.

```

      CLOSE INST-FILE.
      MOVE ZEROS TO TOTALS-A.

```

P-READ-2.

```

      READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
      IF WORKREC-TYPE NOT NUMERIC GO TO P-READ-2.
      IF REC-TYPE = 01 GO TO P-R2.
      IF REC-TYPE = 02 GO TO P-R2.
      IF REC-TYPE = 04 GO TO P-R2.
      IF REC-TYPE = 05 GO TO P-R2.
      GO TO P-READ-2.

```

*

P-R2.

```

      IF SW1 = 1 GO TO P-COMPARE.
      MOVE 1 TO SW1.

```

P-STORE.

```

      MOVE WINST-CODE TO ID-CODE-S.

```

*

P-COMPARE.

```

      IF WINST-CODE NOT = ID-CODE-S GO TO P-CHANGE-ID.
      IF REC-TYPE = 01 NEXT SENTENCE
      ELSE GO TO P-RECORD-02.

```

P-RECORD-01.

```

      MOVE WCOZONE1 TO WZONE.
      GO TO P-READ-2.

```

P-RECORD-02.

```

      IF REC-TYPE = 02 NEXT SENTENCE
      ELSE GO TO P-RECORD-04.
      EXAMINE WPHD-NO REPLACING ALL SPACES BY ZEROS.
      EXAMINE WMSC-NO REPLACING ALL SPACES BY ZEROS.
      EXAMINE WBSC-NO REPLACING ALL SPACES BY ZEROS.
      EXAMINE WTECH-STAFF REPLACING ALL SPACES BY ZEROS.
      EXAMINE WSUPPORT REPLACING ALL SPACES BY ZEROS.
      ADD PHD-NO TO TOT-RDS.
      ADD MSC-NO TO TOT-RDS.
      ADD BSC-NO TO TOT-RDS.

```

```

ADD WSEN-TECHNO    TO TOT-TEC.
ADD WTECHNO        TO TOT-TEC.
ADD WTECHNI        TO TOT-TEC.
GO TO P-READ-2.

```

*

P-RECORD-04.

```

IF REC-TYPE = 05 GO TO P-RECORD-05.
EXAMINE REXP REPLACING ALL SPACES BY ZEROS.
IF RITEM-CODE = '000'
    ADD RUSED TO TOT-PE GO TO P-READ-2.
IF RITEM-CODE = '050'
    ADD RUSED TO TOT-PE GO TO P-READ-2.
ADD RUSED TO TOT-OPER.
GO TO P-READ-2.

```

P-RECORD-05.

```

EXAMINE EXP-1 REPLACING ALL SPACES BY ZEROS.
EXAMINE EXP-2 REPLACING ALL SPACES BY ZEROS.
ADD EXPED11 TO TOT-PE.
ADD EXPED22 TO TOT-OPER.
GO TO P-READ-2.

```

P-CHANGE-ID.

```

PERFORM P-HEAD THRU P-HEAD-EXIT.
PERFORM P-PRINT THRU P-PRINT-EXIT.
MOVE SPACES TO WZONE.
GO TO P-STORE.

```

*

P-HEAD.

```

IF LCT > 0 GO TO P-HEAD-EXIT.
ADD 1 TO PAGECT.
MOVE PAGECT TO H1PAGE.
WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
WRITE LP-REC FROM HEAD2 AFTER 1.
WRITE LP-REC FROM HEAD3 AFTER 2.
WRITE LP-REC FROM HEAD4 AFTER 1.
WRITE LP-REC FROM HEAD5 AFTER 2.
WRITE LP-REC FROM HEAD6 AFTER 1.
WRITE LP-REC FROM HEAD7 AFTER 1.
WRITE LP-REC FROM HEAD7A AFTER 1.
MOVE 50 TO LCT.

```

P-HEAD-EXIT.

EXIT.

*

P-PRINT.

```

IF TMODE (ID-NO-S) = SPACES
    MOVE ID-CODE-S TO L1-CODE
    MOVE SPACES TO L1-NAME
    GO TO P-NEXT-FIELDS.
MOVE TMODE (ID-NO-S) TO CTR2.
MOVE TINST-VM (CTR2) TO L1-NAME.
MOVE ID-CODE-S TO L1-CODE.

```

P-NEXT-FIELDS.

```

MOVE WZONE TO L1-ZONE.
MOVE TOT-RJS TO L1-RJ.
MOVE TOT-TEC TO L1-TECH.
PERFORM P-RATIO THRU P-RATIO-EXIT.
IF TOT-PE = 0
    MOVE ALL '-' TO L1-EMOL-X
ELSE
    MOVE TOT-PE TO L1-EMOL.
IF TOT-OPER = 0
    MOVE ALL '-' TO L1-COST-X
ELSE
    MOVE TOT-OPER TO L1-COST.
ADD TOT-PE TOT-OPER GIVING TOTAL-1.
IF TOTAL-1 = 0
    MOVE ALL '-' TO L1-PERF INR-X

```

```

        ELSE
        MOVE TOTAL-1 TO L1-PEFUND.
        WRITE LP-REC FROM LINE1 AFTER 2.
        MOVE SPACES TO LINE1.
        MOVE ZEROS TO TOTALS-A.
        SUBTRACT 2 FROM LCT.
        IF LCT = 0 WRITE LP-REC FROM HEAD8 AFTER 3.
P-PRINT-EXIT.
        EXIT.
P-RATIO.
        MOVE *:* TO L1-COLON.
        IF TOT-ROS = 0 OR
           TOT-TEC = 0 GO TO P-RAT2.
        IF TOT-ROS < TOT-TEC GO TO P-RAT1.
        DIVIDE TOT-TEC INTO TOT-ROS GIVING L1-RO-RT ROUNDED.
        MOVE 1 TO L1-TEC-RT.
        GO TO P-RATIO-EXIT.
P-RAT1.
        DIVIDE TOT-ROS INTO TOT-TEC GIVING L1-TEC-RT ROUNDED.
        MOVE 1 TO L1-RO-RT.
        GO TO P-RATIO-EXIT.
P-RAT2.
        MOVE TOT-ROS TO L1-RO-RT.
        MOVE TOT-TEC TO L1-TEC-RT.
*
P-RATIO-EXIT.
        EXIT.
P-CLOSE-2.
        PERFORM P-PRINT THRU P-PRINT-EXIT.
        IF LCT > 0 WRITE LP-REC FROM HEAD8 AFTER 3.
        CLOSE DATAFILE
           PRINT-FL.
        STOP RUN.
/*
// L3LTYP TAPE
// EXEC LN<EDT
/&
* ## EDJ

```

(v) PROGRAM RAARPO4A

(a) Program Description

3.52 This program reads two input files viz:- The main data file sorted by subject area - RAARDATA-STØ8 and the subject dictionary file RAARSUBJ. It then extracts record types 09 and 10 which contain project personnel data and produces an output tabulation showing the manpower support for each subject area.

3.53 Input (1) Main data file sorted by subject area on magnetic tape labelled RAARDATA-STØ8 (see 2.21 through 2.34)

(2) Subject dictionary file on diskette which is read as a card file labelled RAARSUBJ (see 2.37)

(3) Parameter card - Latest year of survey

Output - Printout:- TABLE 04A entitled 'Current Research Support for various subject Areas - 1979/80 (Manpower)'
(see Appendices II, III)

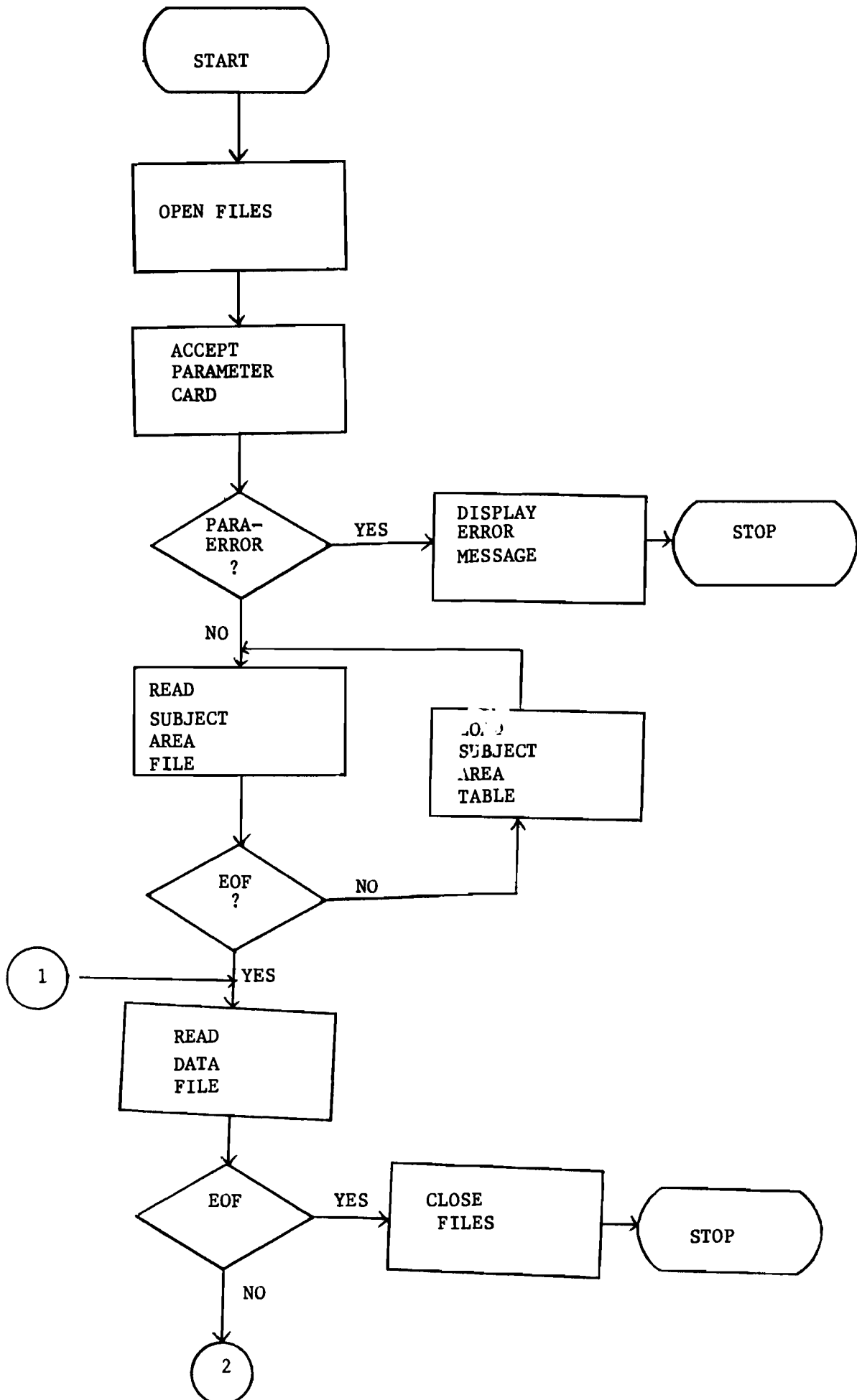
Records Selected - 09 and 10

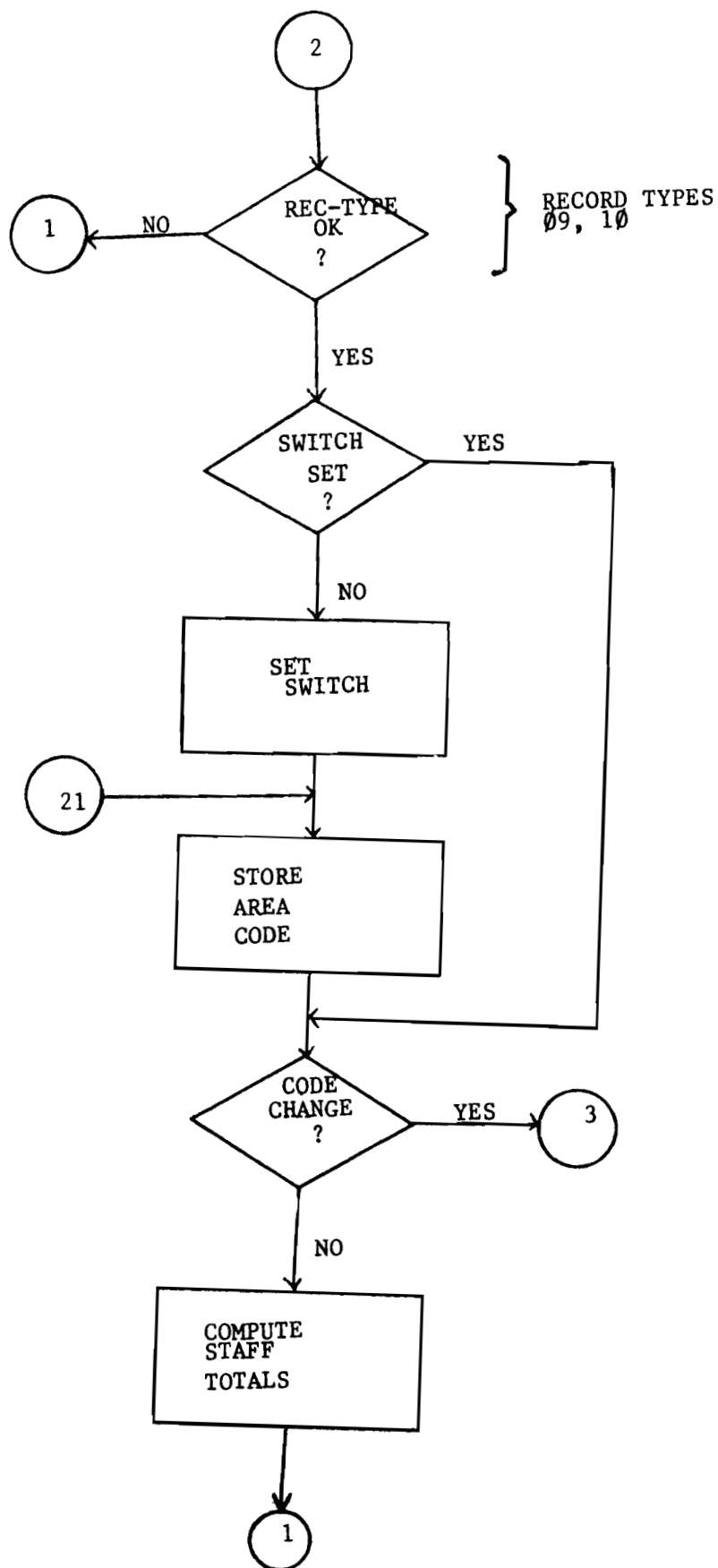
(b) Program Procedure

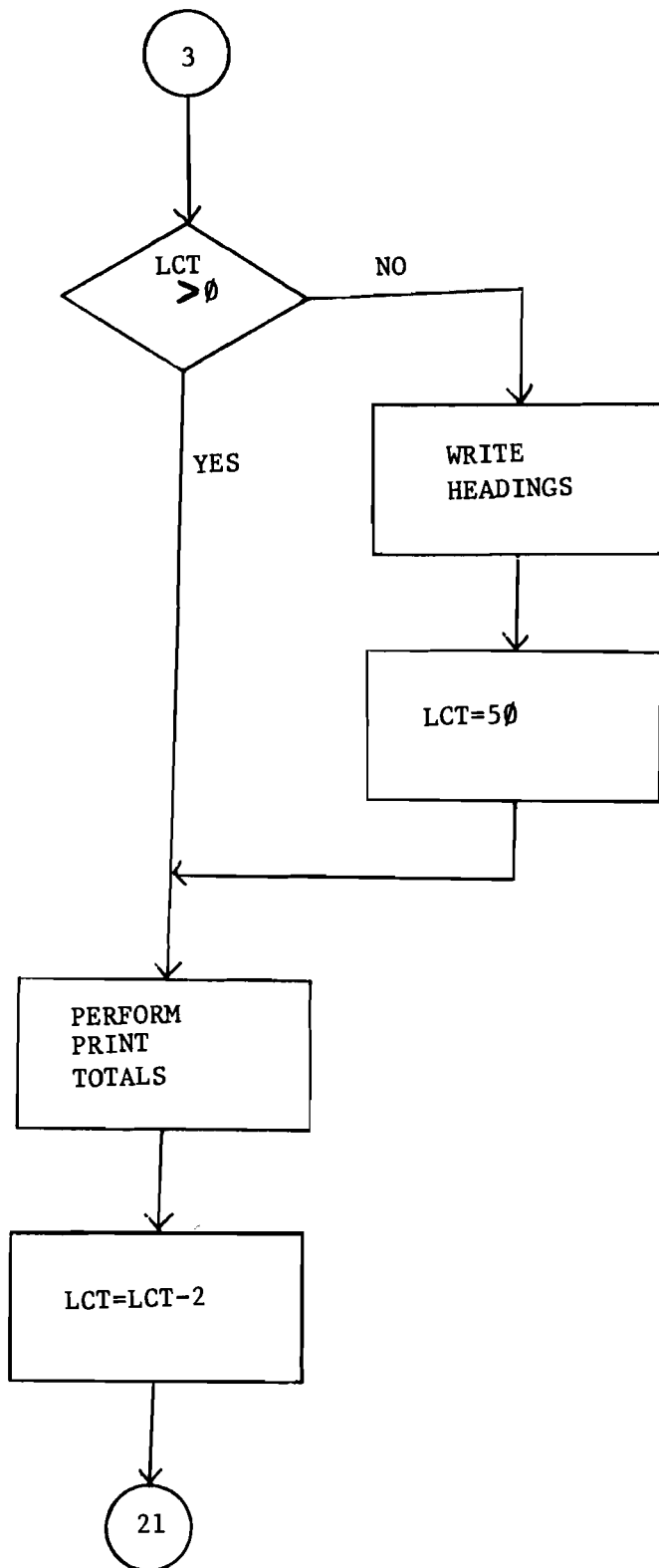
3.54 The program first reads the subject dictionary file into a table in working storage area. The subject code and subject name are stored as well as the modifier the latter of which is subsequently used for retrieving the subject name from the working storage area. Thereafter the program proceeds to read the main data file RAARDATA-STØ8 which has been sorted in subject code order, and extracts record types 09 and 10. All other records are skipped. The program adds up the total number of research officers and technical staff in each subject area. When the subject area code changes the program prints the accumulated totals along with the subject code and name.

For detailed program flowchart and listing see the following pages.

(c) PROGRAM FLOWCHART - RAARP04A







(d) PROGRAM LISTING - RAARP04A

```
* 11 JJB JNM=RAARP04A,CLASS=A,JSER=OPS04000
// JJB RAARP04A
// LIBDEF CL,TJ=USRCL2
// OPTION CATAL
  PHASE RAARP04A,*
// EXEC FCDBJL,SIZE=64K
CBL NJSEQ,CLIST,SKREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP04A.
    AUTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
      SOURCE-COMPUTER. IBM-370.
      OBJECT-COMPUTER. IBM-370.
      SPECIAL-NAMES. CO1 IS NEWPAGE SYSIPT IS CREADER.
    INPUT-OUTPUT SECTION.
      FILE-CONTROL.
        SELECT DATAFILE ASSIGN TO SYS001-JT-3420-S.
        SELECT SUBJFILE ASSIGN TO SYS025-UR-2501-S.
        SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.
    DATA DIVISION.
      FILE SECTION.
        FD SBJFILE RECORDING MODE IS F
          LABEL RECDJS ARE OMITTED
          DATA RECDJ IS SUBJREC.
        * VALUE OF ID IS 'RAARSUBJ'.
        01 SBJREC.
          02 SUBJ-CODE PIC 9(03).
          02 FILLER PIC X.
          02 SUBJ-NAME PIC X(60).
          02 FILLER PIC X(16).
        *
        FD DATAFILE RECORDING MODE IS F
          BLOCK CONTAINS 7000 CHARACTERS
          LABEL RECDJS ARE STANDARD
          DATA RECDJ IS INREC.
        * VALUE OF ID IS 'RAARDATA'.
        01 INREC.
          02 FILLER PIC X(140).
        *
        FD PRINT-FL RECORDING MODE IS F
          LABEL RECDJS ARE OMITTED
          DATA RECDJ IS LP-REC.
        01 LP-REC.
          02 FILLER PIC X(133).
        *
      WORKING-STORAGE SECTION.
        77 LCT PIC 99 VALUE 0.
        77 PAGECT PIC 999 VALUE 0.
        77 SW1 PIC 9 VALUE 0.
        77 CTR-1 PIC 999 VALUE 0.
        77 CTR-2 PIC 999 VALUE 0.
        01 PARA-CARD.
          02 P-SYEAR PIC X(07).
          02 FILLER PIC X(73).
        01 FILLER.
          02 WSUBJ PIC X(03).
          02 WSUBJ-1 REDEFINES WSUBJ PIC 999.
        01 TTOTALS-A.
          02 TDT-P4D-1 PIC 9(04).
          02 TDT-P4D-2 PIC 9(04).
          02 TDT-MSC-1 PIC 9(04).
          02 TDT-MSC-2 PIC 9(04).
          02 TDT-BSC-1 PIC 9(04).
          02 TDT-BSC-2 PIC 9(04).
```



```

02 TOT-TECNO PIC 9(04).
02 TOT-TECNI PIC 9(04).
01 GRAND-TOTALS.
02 GTOT-PHD-1      PIC 9(04).
02 GTOT-PHD-2      PIC 9(04).
02 GTOT-MSC-1      PIC 9(04).
02 GTOT-MSC-2      PIC 9(04).
02 GTOT-BSC-1      PIC 9(04).
02 GTOT-BSC-2      PIC 9(04).
02 GTOT-TECNO      PIC 9(04).
02 GTOT-TECNI      PIC 9(04).
*
01 WORKREC.
02 INST-CODE       PIC X(03).
02 FILLER          PIC X(03).
02 REC-TYPE-1      PIC XX.
02 REC-TYPE REDEFINES REC-TYPE-1 PIC 99.
02 FILLER          PIC X(18).
02 QUALF          PIC X(10).
02 FILLER REDEFINES QUALF.
03 FILLER OCCURS 5.
04 QJAL-X PIC XX.
04 QJAL-9 REDEFINES QJAL-X PIC 99.
02 RES-EXP        PIC XX.
02 NATIDTY        PIC XX.
02 BB K-JK VALUE '01' THRU '02'.
02 PERS-TM        PIC X(03).
02 FILLER          PIC X(57).
02 FILLER          PIC X(04).
02 SUBJ-X         PIC X(03).
02 SUBJ-9 REDEFINES SUBJ-X PIC 9(03).
02 FILLER          PIC X(33).
*
01 WORKREC-10 REDEFINES WORKREC.
02 FILLER          PIC X(08).
02 STAFFIN-X-1     PIC XX.
02 STAFFIN-9 REDEFINES STAFFIN-X-1 PIC 99.
02 FILLER          PIC X(08).
02 STAFFIN-X-2     PIC XX.
02 STAFF-9-2 REDEFINES STAFFIN-X-2 PIC 99.
02 FILLER          PIC X(08).
02 STAFFIN-X-3     PIC XX.
02 STAFF-9-3 REDEFINES STAFFIN-X-3 PIC 99.
02 FILLER          PIC X(08).
02 STAFFIN-X-4     PIC XX.
02 STAFF-9-4 REDEFINES STAFFIN-X-4 PIC 99.
02 FILLER          PIC X(08).
02 FILLER          PIC X(92).
*
01 SBBJ-TABLE.
02 TSUBJ-CODE      PIC X(03) OCCURS 150.
02 TSUBJ-NAME      PIC X(60) OCCURS 150.
02 TMODE          PIC X(03) OCCURS 999.
*
01 FILLER.
02 WQ-1          PIC 99 VALUE 0.
01 LINE1.
02 FILLER        PIC X(03).
02 LISJB-CODE    PIC X(03).
02 FILLER        PIC XX.
02 LISJB-NAME    PIC X(60).
02 FILLER        PIC X(03).
02 LI-PHD-1      PIC ZZ9.
02 FILLER        PIC X.
02 LI-PHD-2      PIC ZZ9.
02 FILLER        PIC X(03).

```

```

02 L1-MS-1          PIC ZZ9.
02 FILLER           PIC X.
02 L1-MS-2          PIC ZZ9.
02 FILLER           PIC X(03).
02 L1-BSC-1         PIC ZZ9.
02 FILLER           PIC X.
02 L1-BSC-2         PIC ZZ9.
02 FILLER           PIC X(04).
02 L1-TECHNO        PIC ZZ9.
02 FILLER           PIC X(06).
02 L1-TECHNI        PIC ZZ9.
02 FILLER           PIC X(07).
02 L1-TOTAL         PIC Z(04)9.
02 FILLER           PIC X(04).
*
01 HEAD1.
02 FILLER           PIC X(03) VALUE SPACES.
02 HDATE            PIC X(08).
02 FILLER           PIC X(14) VALUE SPACES.
02 FILLER           PIC X(55) VALUE
  'N A T I O N A L C O U N C I L F O R S C I E N C E '.
02 FILLER           PIC X(30) VALUE
  ' A N D T E C H N O L O G Y '.
02 FILLER           PIC X(11) VALUE SPACES.
02 FILLER           PIC X(05) VALUE 'PAGE:'.
02 H1PAGE           PIC ZZ9.
02 FILLER           PIC X(04) VALUE SPACES.
*
01 HEAD2.
02 FILLER           PIC X(46) VALUE SPACES.
02 FILLER           PIC X(45) VALUE
  'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH '.
02 FILLER           PIC X(42) VALUE SPACES.
*
01 HEAD3.
02 FILLER           PIC X(12) VALUE ' TABLE 04A'.
02 FILLER           PIC X(25) VALUE SPACES.
02 FILLER           PIC X(53) VALUE
  'CURRENT RESEARCH SUPPORT FOR VARIOUS SUBJECT AREAS - '.
02 H3PERIOD         PIC X(07) VALUE SPACES.
02 FILLER           PIC X(11) VALUE ' (MANPOWER)'.
02 FILLER           PIC X(25) VALUE SPACES.
*
01 HEAD3A.
02 FILLER           PIC X(37) VALUE SPACES.
02 FILLER           PIC X(71) VALUE ALL '-'.
02 FILLER           PIC X(25) VALUE SPACES.
*
01 HEAD4.
02 FILLER           PIC X(03) VALUE SPACES.
02 FILLER           PIC X(33) VALUE
  'S U B J E C T A R E A '.
02 FILLER           PIC X(36) VALUE SPACES.
02 FILLER           PIC X(55) VALUE
  '*****M A N P O W E R *****'.
02 FILLER           PIC X(06) VALUE '*** '.
*
01 HEAD5.
02 FILLER           PIC X(03) VALUE SPACES.
02 FILLER           PIC X(33) VALUE SPACES.
*
02 FILLER           PIC X(36) VALUE SPACES.
02 FILLER           PIC X(52) VALUE
  ' P4D MSC BSC TO/TECNOL TA/TECNIC '.
02 FILLER           PIC X(09) VALUE 'TOTAL '.
*

```

```

01 HEAD6.
02 FILLER      PIC XXX VALUE SPACES.
02 FILLER      PIC X(33) VALUE ALL '-'.
02 FILLER      PIC X(35) VALUE SPACES.
02 FILLER      PIC X(52) VALUE
    '-----'
02 FILLER      PIC X(09) VALUE  '-----' '.

*
01 HEAD7.
02 FILLER      PIC X(73) VALUE SPACES.
02 FILLER      PIC X      VALUE 'K'.
02 FILLER      PIC X(03) VALUE SPACES.
02 FILLER      PIC X      VALUE 'O'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X      VALUE 'K'.
02 FILLER      PIC X(03) VALUE SPACES.
02 FILLER      PIC X      VALUE 'O'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X      VALUE 'K'.
02 FILLER      PIC X(03) VALUE SPACES.
02 FILLER      PIC X      VALUE 'O'.
02 FILLER      PIC X(35) VALUE SPACES.

*
01 HEAD8.
02 FILLER      PIC X(73) VALUE SPACES.
02 FILLER      PIC X      VALUE '-'.
02 FILLER      PIC XXX VALUE SPACES.
02 FILLER      PIC X      VALUE '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X      VALUE '-'.
02 FILLER      PIC XXX VALUE SPACES.
02 FILLER      PIC X      VALUE '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X      VALUE '-'.
02 FILLER      PIC XXX VALUE SPACES.
02 FILLER      PIC X      VALUE '-'.
02 FILLER      PIC X(35) VALUE SPACES.

*
01 HEAD9.
02 FILLER      PIC X(25) VALUE SPACES.
02 FILLER      PIC X(05) VALUE 'NOTE:'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(36) VALUE
    '< = KENYAN , O = OTHER NATIONALITIES'.
02 FILLER      PIC X(63) VALUE SPACES.

*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT      DATAFILE
                   SUBJFILE
    OUTPUT          PRINT-FL.

*
    MOVE SPACES     TO     LINE1 SUBJ-TABLE.
    MOVE ZEROS      TO     TOTALS-A GRAND-TOTALS.
    MOVE 1          TO     CTR-1.
    MOVE CURRENT-DATE TO     HDATE.
    ACCEPT PARA-CARD FROM CREADER.
    IF P-SYEAR = SPACES
        DISPLAY 'PARAMETER ERROR' PARA-CARD
        DISPLAY 'RUN ABANDONED' STOP RUN.
    MOVE P-SYEAR TO H3PERIOD.

*
P-READ-1.
    READ SUBJFILE AT END GO TO P-CLOSE-1.
    IF CTR-1 > 150 GO TO P-TABLE-FULL.
    MOVE SUBJ-CODE TO TSUBJ-CODE (CTR-1).

```

```

        MOVE SBJJ-NAME TO TSUBJ-NAME (CTR-1).
        MOVE CTR-1 TO TMODE (SUBJ-CJDE).
        ADD 1 TO CTR-1.
        GO TO P-READ-1.
*
P-TABLE-FULL.
        DISPLAY 'SUBJECT TABLE FULL '.
        DISPLAY 'RUN ABANDONED'.
        STOP RJN.
*
P-CLOSE-1.
        CLOSE SUBJFILE.
*
P-READ-2.
        READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
        IF REC-TYPE-1 NOT NUMERIC GO TO P-READ-2.
        IF REC-TYPE = 09 GO TO P-R2.
        IF REC-TYPE = 10 GO TO P-R2.
        GO TO P-READ-2.
*
P-R2.
        IF SW1 = 1 GO TO P-COMPARE.
        MOVE 1 TO SW1.
*
P-STORE-R3.
        MOVE SBJJ-X TO WSUBJ.
*
P-COMPARE.
        IF SUBJ-X NOT = WSUBJ GO TO P-SBJJ-CHANGE.
        IF REC-TYPE = 09 NEXT SENTENCE
        ELSE GO TO P-RECORD-10.
P-RECORD-09.
        EXAMINE QUALF REPLACING ALL SPACES BY ZEROS.
        PERFORM P-SEARCH-S THRU P-SEARCH-EXIT.
        IF K-OK NEXT SENTENCE ELSE GO TO P-NON-KENYAN.
        IF WQ-1 = 09 ADD 1 TO TOT-PHD-1.
        IF WQ-1 = 07 ADD 1 TO TOT-MSC-1.
        IF WQ-1 = 01 ADD 1 TO TOT-BSC-1.
        IF WQ-1 = 02 ADD 1 TO TOT-BSC-1.
        GO TO P-READ-2.
*
P-NON-KENYAN.
        IF WQ-1 = 09 ADD 1 TO TOT-PHD-2.
        IF WQ-1 = 07 ADD 1 TO TOT-MSC-2.
        IF WQ-1 = 01 ADD 1 TO TOT-BSC-2.
        IF WQ-1 = 02 ADD 1 TO TOT-BSC-2.
        GO TO P-READ-2.
*
P-RECORD-10.
        EXAMINE STAFFIN-X-1 REPLACING ALL SPACES BY ZEROS.
        EXAMINE STAFFIN-X-2 REPLACING ALL SPACES BY ZEROS.
        EXAMINE STAFFIN-X-3 REPLACING ALL SPACES BY ZEROS.
        EXAMINE STAFFIN-X-4 REPLACING ALL SPACES BY ZEROS.
*
        ADD STAFFIN-9 TO TOT-TECNO.
        ADD STAFF-9-2 TO TOT-TECNO.
        ADD STAFF-9-3 TO TOT-TECNI.
        GO TO P-READ-2.
*
P-SEARCH-S.
        MOVE 1 TO CTR-1.
        MOVE 0 TO WQ-1.
P-SEARCH-1.
        IF CTR-1 > 5 GO TO P-SEARCH-EXIT.
        IF QJAL-9 (CTR-1) > WQ-1
        MOVE QJAL-9 (CTR-1) TO WQ-1.

```

```

      ADD 1 TO CTR-1.
      GO TO P-SEARCH-1.
P-SEARCH-EXIT.
      EXIT.
P-SJBJ-CHANGE.
      PERFORM P-HEAD THRU P-HEAD-EXIT.
      PERFORM P-PRINT THRU P-PRINT-EXIT.
      GO TO P-STORE-R3.
*
```

P-HEAD.

```

      IF LCT > 0 GO TO P-HEAD-EXIT.
      ADD 1 TO PAGECT.
      MOVE PAGECT TO H1PAGE.
      WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
      WRITE LP-REC FROM HEAD2 AFTER 1.
      WRITE LP-REC FROM HEAD3 AFTER 1.
      WRITE LP-REC FROM HEAD3A AFTER 1.
      WRITE LP-REC FROM HEAD4 AFTER 2.
      WRITE LP-REC FROM HEAD5 AFTER 2.
      WRITE LP-REC FROM HEAD6 AFTER 1.
      WRITE LP-REC FROM HEAD7 AFTER 1.
      WRITE LP-REC FROM HEAD8 AFTER 1.
      MOVE 40 TO LCT.
P-HEAD-EXIT.
      EXIT.
P-GTOT.
      ADD TOT-PHD-1 TO GTOT-PHD-1.
      ADD TOT-PHD-2 TO GTOT-PHD-2.
      ADD TOT-MSC-1 TO GTOT-MSC-1.
      ADD TOT-MSC-2 TO GTOT-MSC-2.
      ADD TOT-BSC-1 TO GTOT-BSC-1.
      ADD TOT-BSC-2 TO GTOT-BSC-2.
      ADD TOT-TECNO TO GTOT-TECNO.
      ADD TOT-TECNI TO GTOT-TECNI.
P-GTOT-EXIT.
      EXIT.
*
```

P-PRINT.

```

      IF WSUBJ NOT NUMERIC OR
      WSUBJ-1 = 0
      MOVE WSUBJ TO LISUB-CODE
      GO TO P-MOVE-AMTS.
      MOVE WSJBJ-1 TO LISJB-CODE.
      MOVE TMJDE (WSJBJ-1) TO CTR-2.
      MOVE TSUBJ-NAME (CTR-2) TO LISJB-NAME.
P-MOVE-AMTS.
      MOVE TOT-PHD-1 TO L1-PHD-1.
      MOVE TOT-PHD-2 TO L1-PHD-2.
      MOVE TOT-MSC-1 TO L1-MSC-1.
      MOVE TOT-MSC-2 TO L1-MSC-2.
      MOVE TOT-BSC-1 TO L1-BSC-1.
      MOVE TOT-BSC-2 TO L1-BSC-2.
      MOVE TOT-TECNO TO L1-TECHNO.
      MOVE TOT-TECNI TO L1-TECHNI.
      ADD
          TOT-PHD-1
          TOT-PHD-2
          TOT-MSC-1
          TOT-MSC-2
          TOT-BSC-1
          TOT-BSC-2
          TOT-TECNO
          TOT-TECNI
          GIVING
          L1-TOTAL.
      WRITE LP-REC FROM LINE1 AFTER 2.
      SJBTACT 2 FROM LCT.
      IF LCT = 0 WRITE LP-REC FROM HEAD9 AFTER 3.

```

```

        MOVE SPACES TO LINE1.
P-PRT.
        PERFORM P-GTOT THRU P-GTOT-EXIT.
        MOVE ZEROS TO TOTALS-A.
P-PRINT-EXIT.
        EXIT.
*
P-CLOSE-2.
        PERFORM P-PRINT THRU P-PRINT-EXIT.
        IF LCT > 0 WRITE LP-REC FROM HEAD9 AFTER 3.
*
        MOVE GRAND-TOTALS TO TOTALS-A.
*
        MOVE 'GRAND TOTAL' TO LISUB-NAME.
*
        PERFORM P-MOVE-AMTS.
        CLOSE DATAFILE
            PRINT-FL.
        STOP RJN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/&
* ** EDJ

```

(vi) PROGRAM RAARPO4B

(a) Program Description

3.55 This program is similar to program RAARPO4A described in 3.52 above. The difference lies in the records selected. This program uses record types 11 and 12 containing the recurrent and capital costs for each subject area.

3.56 Input (1) Main data file sorted by subject area on magnetic tape
Labelled RAARDATA-ST09 (see 2.21 through 2.34)

(2) Subject dictionary file on diskette which is loaded into the program as a Card file - Labelled RAARSUBJ (see 2.37)

(3) Parameter card - latest year of survey

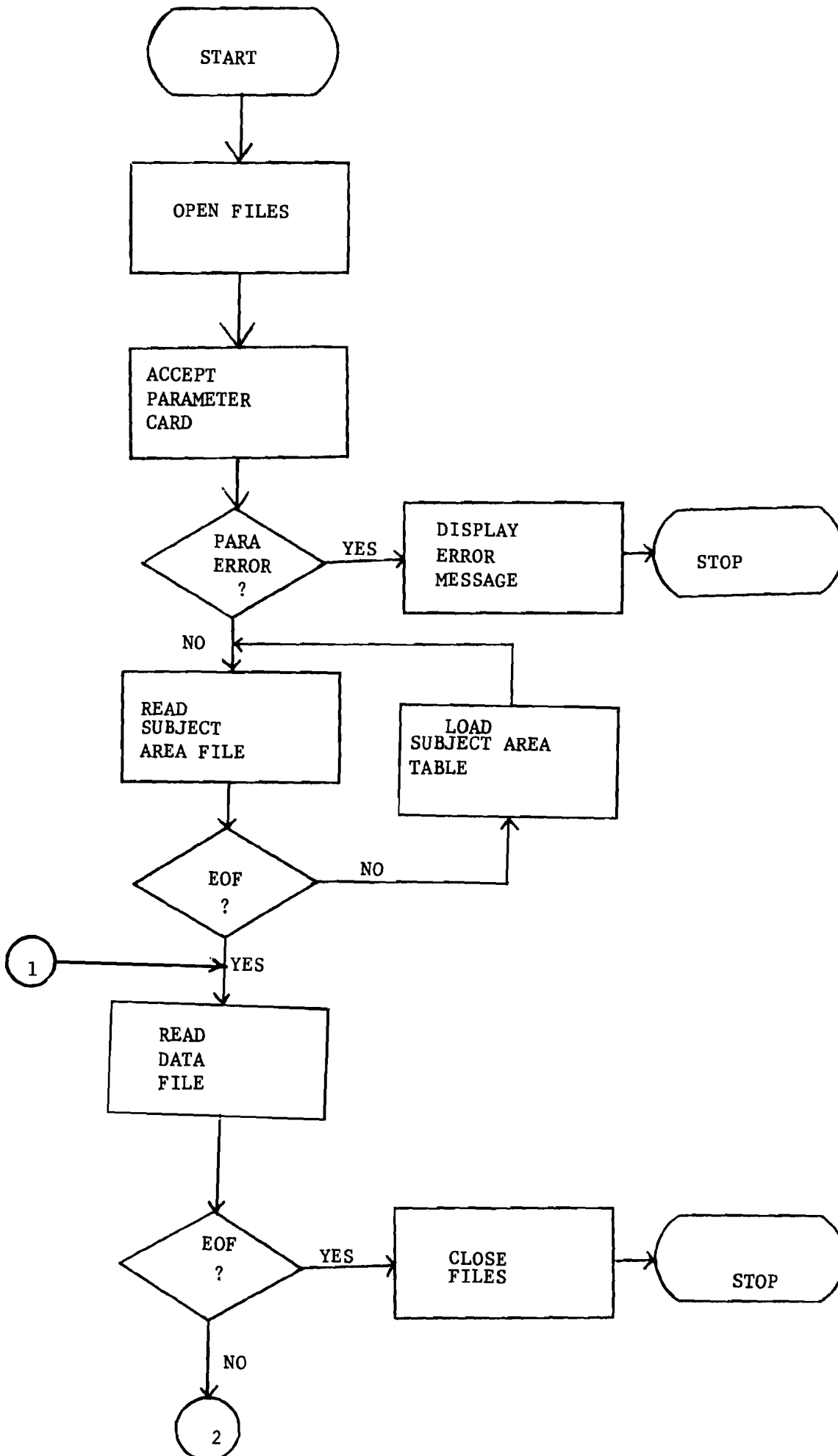
Output - Printout - TABLE 04B entitled 'Current Research support for various subject areas - 1979/80 (Funding)' (see Appendices II, III)

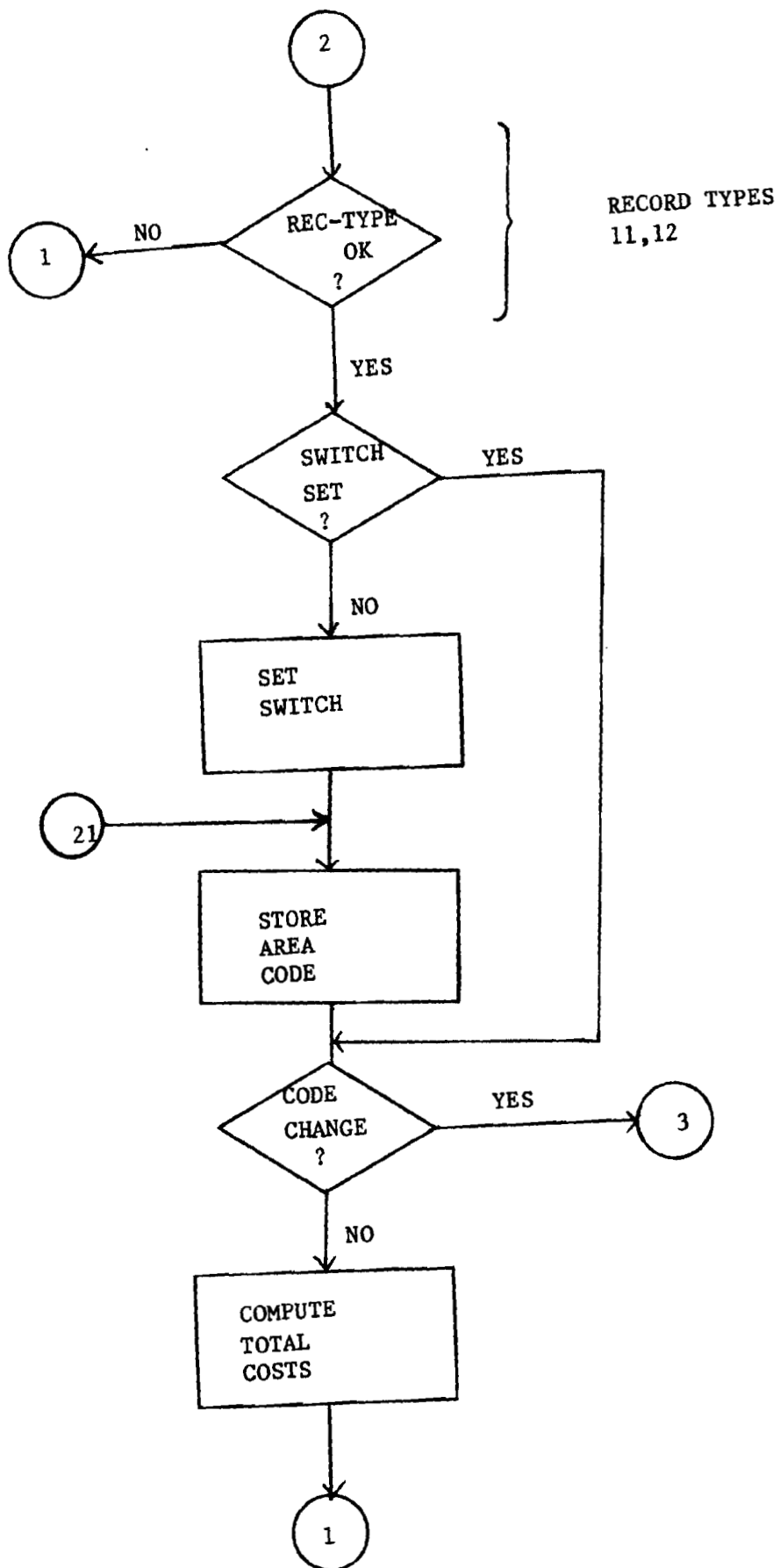
Records selected - 11 & 12

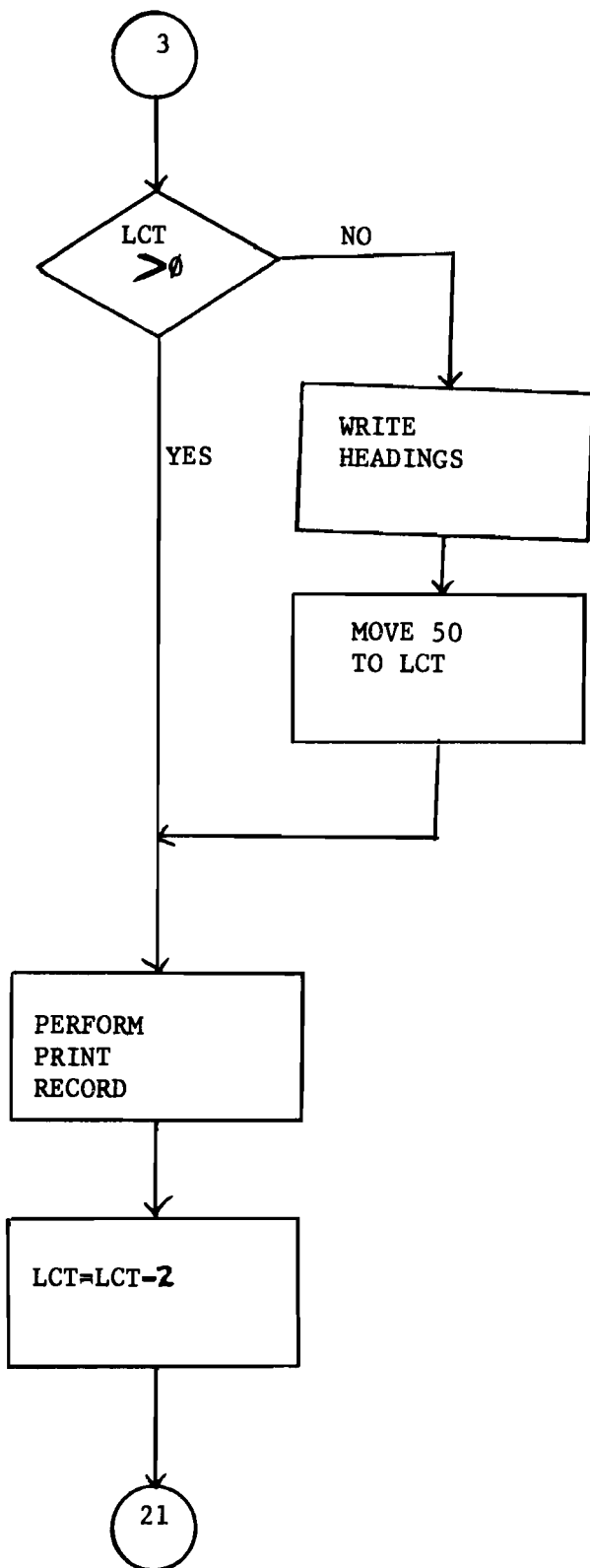
(b) Program Procedure

3.57 The program reads the subject dictionary file and stores the subject code and name into the working storage.
Then the program proceeds to read the sorted main data file and extracts record types 11 and 12. Recurrent and capital costs are accumulated for each subject area and printed along with the subject code and name when the subject code changes. For program flowchart and listing see the proceeding pages.

(c) PROGRAM FLOWCHART - RAARP04B







(d) PROGRAM LISTING - RAARP04B

```
* EXEC JOB JNM=RAARP04B,CLASS=A,USER=OPSD4000
// JOB RAARP04B
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP04B,*
// EXEC FCDBJL,SIZE=64<
CBL NJSEQ,CLIST,SXREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP04B.
    AJTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
      SOURCE-COMPUTER. IBM-370.
      OBJECT-COMPUTER. IBM-370.
      SPECIAL-NAMES. CO1 IS NEWPAGE SYSIPT IS CREADER.
    INPUT-OUTPUT SECTION.
      FILE-CONTROL.
        SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
        SELECT SUBJFILE ASSIGN TO SYS025-UR-2501-S.
        SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S.
    DATA DIVISION.
      FILE SECTION.
        FD SUBJFILE RECORDING MODE IS F
          LABEL RECORDS ARE OMITTED
          DATA RECORD IS SUBJREC.
        * VALJE OF ID IS 'RAARSUBJ'.
        01 SUBJREC.
          02 SUBJ-CODE PIC 9(03).
          02 FILLER PIC X.
          02 SUBJ-NAME PIC X(60).
          02 FILLER PIC X(16).
        *
        FD DATAFILE RECORDING MODE IS F
          BLOCK CONTAINS 7000 CHARACTERS
          LABEL RECORDS ARE STANDARD
          DATA RECORD IS INREC.
        * VALUE OF ID IS 'RAARDATA'.
        01 INREC.
          02 FILLER PIC X(140).
        *
        FD PRINT-FL RECORDING MODE IS F
          LABEL RECORDS ARE OMITTED
          DATA RECORD IS LP-REC.
        01 LP-REC.
          02 FILLER PIC X(133).
        *
      WORKING-STORAGE SECTION.
        77 LCT PIC 99 VALUE 0.
        77 PAGECT PIC 999 VALUE 0.
        77 SW1 PIC 9 VALUE 0.
        77 CTR-1 PIC 999 VALUE 0.
        77 CTR-2 PIC 999 VALUE 0.
        01 PARA-CARD.
          02 P-SYEAR PIC X(07).
          02 FILLER PIC X(73).
        01 FILLER.
          02 WSUBJ PIC X(03).
          02 WSUBJ-1 REDEFINES WSUBJ PIC 999.
        01 TTOTALS-A.
          02 TOT-PERS PIC 9(09).
          02 TOT-OPER PIC 9(09).
          02 TOT-PJ PIC 9(09).
          02 TOT-CAP PIC 9(09).
          02 TOTAL-1 PIC 9(09).
        01 GRAND-TOTALS.
          02 GTOT-PERS PIC 9(09).
```

```

02 GTOT-OPER      PIC 9(09).
02 GTOT-PO        PIC 9(09).
02 GTOT-CAP       PIC 9(09).
02 GTOT-T         PIC 9(09).
*
01 WORKREC.
02 INST-CODE      PIC X(03).
02 FILLER         PIC X(03).
02 REC-TYPE-1     PIC XX.
02 REC-TYPE REDEFINES REC-TYPE-1 PIC 99.
02 RECURRENT-C.
03 PERS-COST-L    PIC 9(07).
03 PERS-COST-A    PIC 9(07).
03 OPER-COST-L    PIC 9(07).
03 OPER-COST-A    PIC 9(07).
02 FILLER         PIC X(64).
02 FILLER         PIC X(04).
02 SUBJ-X         PIC X(03).
02 SUBJ-9 REDEFINES SUBJ-X PIC 9(03).
02 FILLER         PIC X(33).
*
01 WORKREC-12 REDEFINES WORKREC.
02 FILLER         PIC X(19).
02 CAPITAL-COST.
03 CAPITAL-1      PIC 9(06).
03 FILLER         PIC X(11).
03 CAPITAL-2      PIC 9(06).
03 FILLER         PIC X(11).
03 CAPITAL-3      PIC 9(06).
03 FILLER         PIC X(11).
03 CAPITAL-4      PIC 9(06).
03 FILLER         PIC X(11).
03 CAPITAL-5      PIC 9(06).
02 FILLER         PIC X(47).
*
01 SUBJ-TABLE.
02 TSUBJ-CODE     PIC X(03) OCCURS 150.
02 TSUBJ-NAME     PIC X(60) OCCURS 150.
02 TMODE         PIC X(03) OCCURS 999.
*
01 LINE1.
02 FILLER        PIC X(03).
02 LISUB-CODE     PIC X(03).
02 FILLER        PIC XX.
02 LISUB-NAME     PIC X(60).
02 FILLER        PIC X(03).
02 LI-PERS        PIC Z(08)9.
02 LIAMT-1 REDEFINES LI-PERS.
03 FILLER        PIC X(06).
03 LIPERS        PIC X(03).
02 FILLER        PIC X(02).
02 LI-OPER        PIC Z(08)9.
02 LIAMT-2 REDEFINES LI-OPER.
03 FILLER        PIC X(06).
03 LIOPER        PIC X(03).
02 FILLER        PIC X.
02 LI-TOT-PO      PIC Z(08)9.
02 LIAMT-3 REDEFINES LI-TOT-PO.
03 FILLER        PIC X(06).
03 LITOTPO       PIC X(03).
02 FILLER        PIC X(02).
02 LI-CAP         PIC Z(08)9.
02 LIAMT-4 REDEFINES LI-CAP.
03 FILLER        PIC X(06).
03 LICAP         PIC X(03).
02 FILLER        PIC X(04).

```

```

02 L1-TOTAL          PIC Z(08)9.
02 L1TOT REDEFINES L1-TOTAL.
03 FILLER            PIC X(06).
03 L1TOTAL           PIC X(03).
02 FILLER            PIC X(08).
*
01 HEAD1.
02 FILLER            PIC X(03) VALUE SPACES.
02 H1DATE            PIC X(08).
02 FILLER            PIC X(14) VALUE SPACES.
02 FILLER            PIC X(55) VALUE
    'N A T I O N A L C O U N C I L F O R S C I E N C E '.
02 FILLER            PIC X(30) VALUE
    ' A N D T E C H N O L O G Y '.
02 FILLER            PIC X(11) VALUE SPACES.
02 FILLER            PIC X(05) VALUE 'PAGE:'.
02 H1PAGE            PIC ZZ9.
02 FILLER            PIC X(04) VALUE SPACES.
*
01 HEAD2.
02 FILLER            PIC X(46) VALUE SPACES.
02 FILLER            PIC X(45) VALUE
    'RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH '.
02 FILLER            PIC X(42) VALUE SPACES.
*
01 HEAD3.
02 FILLER            PIC X(12) VALUE ' TABLE 048'.
02 FILLER            PIC X(25) VALUE SPACES.
02 FILLER            PIC X(53) VALUE
    'CURRENT RESEARCH SUPPORT FOR VARIOUS SUBJECT AREAS - '.
02 H3PERIOD          PIC X(07) VALUE SPACES.
02 FILLER            PIC X(10) VALUE ' (FUNDING)'.
02 FILLER            PIC X(26) VALUE SPACES.
*
01 HEAD3A.
02 FILLER            PIC X(37) VALUE SPACES.
02 FILLER            PIC X(70) VALUE ALL '-'.
02 FILLER            PIC X(26) VALUE SPACES.
*
01 HEAD4.
02 FILLER            PIC X(03) VALUE SPACES.
02 FILLER            PIC X(33) VALUE
    'S J B J E C T A R E A '.
02 FILLER            PIC X(35) VALUE SPACES.
02 FILLER            PIC X(40) VALUE
    '*****F J N D I N G - KENYA POUNDS*****'.
02 FILLER            PIC X(22) VALUE SPACES.
*
01 HEAD5.
02 FILLER            PIC X(71) VALUE SPACES.
02 FILLER            PIC X(42) VALUE
    '***R E C U R R E N T** CAPITAL'.
02 FILLER            PIC X(20) VALUE SPACES.
*
01 HEAD6.
02 FILLER            PIC X(03) VALUE SPACES.
02 FILLER            PIC X(33) VALUE SPACES.
02 FILLER            PIC X(35) VALUE SPACES.
02 FILLER            PIC X(32) VALUE
    'PERSONNEL OPERATING TOTAL P/O'.
02 FILLER            PIC X(13) VALUE SPACES.
02 FILLER            PIC X(09) VALUE 'T O T A L'.
02 FILLER            PIC X(08) VALUE SPACES.
*
01 HEAD7.
02 FILLER            PIC X(03) VALUE SPACES.

```

```

02 FILLER      PIC X(33) VALUE ALL '-'.
02 FILLER      PIC X(35) VALUE SPACES.
02 FILLER      PIC X(09) VALUE ALL '-'.
02 FILLER      PIC XX      VALUE SPACES.
02 FILLER      PIC X(09) VALUE ALL '-'.
02 FILLER      PIC X      VALUE SPACES.
02 FILLER      PIC X(09) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(07) VALUE ALL '-'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(09) VALUE ALL '-'.
02 FILLER      PIC X(08) VALUE SPACES.

*
01 HEAD8.
02 FILLER      PIC X(25) VALUE SPACES.
02 FILLER      PIC X(05) VALUE 'NOTE:'.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(31) VALUE
      '--- = INFORMATION NOT AVAILABLE'.
02 FILLER      PIC X(68) VALUE SPACES.

*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT      DATAFILE
                   SUBJFILE
    OUTPUT          PRINT-FL.

*
    MOVE SPACES     TO LINE1 SUBJ-TABLE.
    MOVE ZEROS      TO TOTALS-A GRAND-TOTALS.
    MOVE 1          TO CTR-1.
    MOVE CURRENT-DATE TO HDATE.
    ACCEPT PARA-CARD FROM CREADER.
    IF P-SYEAR = SPACES
        DISPLAY 'PARAMETER ERROR' PARA-CARD
        DISPLAY 'RUN ABANDONED' STOP RUN.
    MOVE P-SYEAR TO H3PERIOD.

*
P-READ-1.
    READ SUBJFILE AT END GO TO P-CLOSE-1.
    IF CTR-1 > 150 GO TO P-TABLE-FULL.
    MOVE SUBJ-CODE TO TSUBJ-CODE (CTR-1).
    MOVE SUBJ-NAME TO TSUBJ-NAME (CTR-1).
    MOVE CTR-1 TO TMODE (SUBJ-CODE).
    ADD 1 TO CTR-1.
    GO TO P-READ-1.

*
P-TABLE-FULL.
    DISPLAY 'SUBJECT TABLE FULL '.
    DISPLAY 'RUN ABANDONED'.
    STOP RUN.

*
P-CLOSE-1.
    CLOSE SUBJFILE.

*
P-READ-2.
    READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
    IF REC-TYPE-1 NOT NUMERIC GO TO P-READ-2.
    IF REC-TYPE = 11 GO TO P-R2.
    IF REC-TYPE = 12 GO TO P-R2.
    GO TO P-READ-2.

*
P-R2.
    IF SW1 = 1 GO TO P-COMPARE.
    MOVE 1 TO SW1.

*
P-STORE-R3.

```

```

      MOVE SUBJ-X      TO  WSUBJ.
*
P-COMPARE.
  IF SUBJ-X NOT = WSUBJ GO TO P-SUBJ-CHANGE.
  IF REC-TYPE = 11 NEXT SENTENCE
  ELSE GO TO P-RECORD-12.
P-RECORD-11.
  EXAMINE RECURRENT-C REPLACING ALL SPACES BY ZEROS.
  ADD PERS-COST-L      TO TOT-PERS.
  ADD PERS-COST-A      TO TOT-PERS.
  ADD OPER-COST-L      TO TOT-OPER.
  ADD OPER-COST-A      TO TOT-OPER.
  GO TO P-READ-2.
P-RECORD-12.
  EXAMINE CAPITAL-COST REPLACING ALL SPACES BY ZEROS.
  ADD CAPITAL-1
    CAPITAL-2
    CAPITAL-3
    CAPITAL-4
    CAPITAL-5
    GIVING TOTAL-1.
  ADD TOTAL-1          TO  TOT-CAP.
  GO TO P-READ-2.
*
P-SUBJ-CHANGE.
  PERFORM P-HEAD THRU P-HEAD-EXIT.
  PERFORM P-PRINT THRU P-PRINT-EXIT.
  GO TO P-STORE-R3.
*
P-HEAD.
  IF LCT > 0 GO TO P-HEAD-EXIT.
  ADD 1 TO PAGECT.
  MOVE PAGECT TO H1PAGE.
  WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
  WRITE LP-REC FROM HEAD2 AFTER 1.
  WRITE LP-REC FROM HEAD3 AFTER 1.
  WRITE LP-REC FROM HEAD3A AFTER 1.
  WRITE LP-REC FROM HEAD4 AFTER 2.
  WRITE LP-REC FROM HEAD5 AFTER 1.
  WRITE LP-REC FROM HEAD6 AFTER 1.
  WRITE LP-REC FROM HEAD7 AFTER 1.
  MOVE 40 TO LCT.
P-HEAD-EXIT.
  EXIT.
*
P-PRINT.
  IF WSUBJ NOT NUMERIC OR
    WSUBJ-1 = 0
    MOVE WSUBJ TO LISUB-CODE
    GO TO P-MOVE-AMTS.
  MOVE WSUBJ-1 TO LISUB-CODE.
  MOVE TMODE (WSUBJ-1) TO CTR-2.
  MOVE TSUBJ-NAME (CTR-2) TO LISUB-NAME.
P-MOVE-AMTS.
  IF TOT-PERS = 0 MOVE '---' TO L1PERS ELSE
  MOVE TOT-PERS TO L1-PERS.
  IF TOT-OPER = 0 MOVE '---' TO L1OPER ELSE
  MOVE TOT-OPER TO L1-OPER.
  ADD TOT-PERS TOT-OPER GIVING TOT-PO.
  IF TOT-PO = 0 MOVE '---' TO L1TOTPO ELSE
  MOVE TOT-PO TO L1-TOT-PO.
  IF TOT-CAP = 0 MOVE '---' TO L1CAP ELSE
  MOVE TOT-CAP TO L1-CAP.
  ADD TOT-PO TOT-CAP GIVING TOTAL-1.
  IF TOTAL-1 = 0 MOVE '---' TO L1TOTAL ELSE
  MOVE TOTAL-1 TO L1-TOTAL.

```

```

        WRITE LP-REC FROM LINE1 AFTER 2.
        SUBTRACT 2 FROM LCT.
        IF LCT = 0 WRITE LP-REC FROM HEAD8 AFTER 3.
        MOVE SPACES TO LINE1.
P-PRT.
        PERFORM P-GTOT THRU P-GTOT-EXIT.
        MOVE ZEROS TO TOTALS-A.
P-PRINT-EXIT.
        EXIT.
P-GTOT.
        ADD TOT-PERS TO GTOT-PERS.
        ADD TOT-JPER TO GTOT-OPER.
        ADD TOT-PO TO GTOT-PJ.
        ADD TOT-CAP TO GTOT-CAP.
        ADD TOTAL-1 TO GTOT-T.
P-GTOT-EXIT.
        EXIT.
*
P-CLOSE-2.
        PERFORM P-PRINT THRU P-PRINT-EXIT.
        IF LCT > 0 WRITE LP-REC FROM HEAD8 AFTER 3.
*      MOVE GTOT-PERS TO TOT-PERS.
*      MOVE GTOT-JPER TO TOT-OPER.
*      MOVE GTOT-CAP TO TOT-CAP.
*      MOVE 'GRAND TOTAL' TO LISUB-NAME.
*      PERFORM P-MOVE-AMTS.
        CLOSE DATAFILE
        PRINT-FL.
        STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/&
* ££ EOJ

```


(vii) PROGRAM RAARP05

(a) Program Description

- 3.58 This program produces two tables - TABLE 05A and TABLE 05B. Table 05A is produced for Government Institutions and 05B for non-Government Institutions. Both the tables derive their information from Record type 04 - institutional expenditure item by item. The program reads a parameter card which gives the table number and the sub-heading for the table being produced.
- 3.59 Input: (1) Sorted main data file on magnetic tape labelled RAARDATA-ST1Ø (See 2.21 through 2.34)
- (2) Institution dictionary file on diskette, which is loaded as a card file labelled RAARINST (see 2.36)
- (3) Parameter Card - table number 5A or 5B, table sub-heading and latest year of survey

Records selected - 04 from RAARDATA-ST1Ø

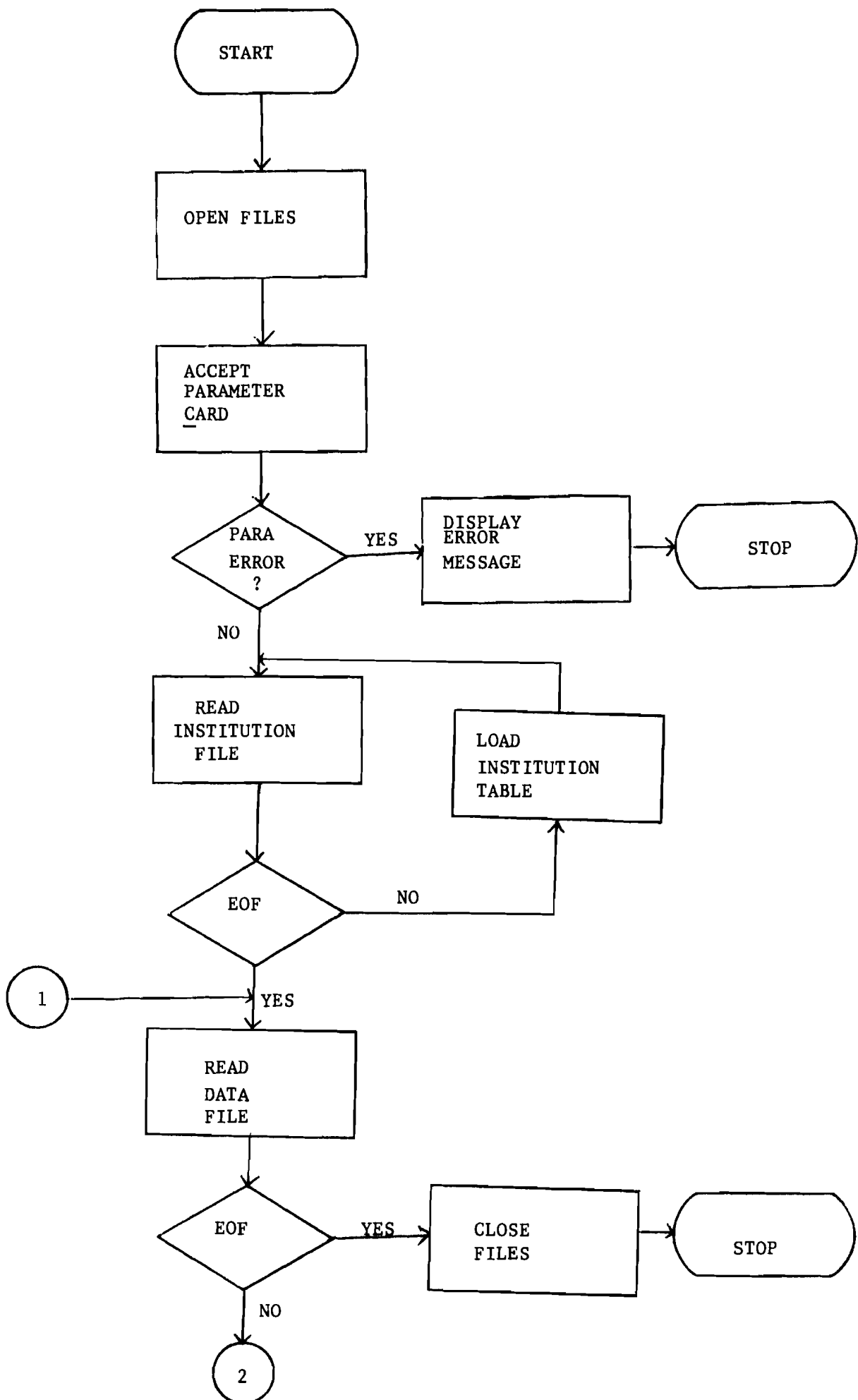
- OUTPUT: (1) Printout:- TABLE 05A entitled
'Utilization of Funds by Research Institutions
- GOVERNMENT INSTITUTIONS POOLED'
- (2) Printout:- TABLE 05B entitled
'Utilization of Funds by Research Institutions
- Other institutions pooled'. (see Appendices II, III)

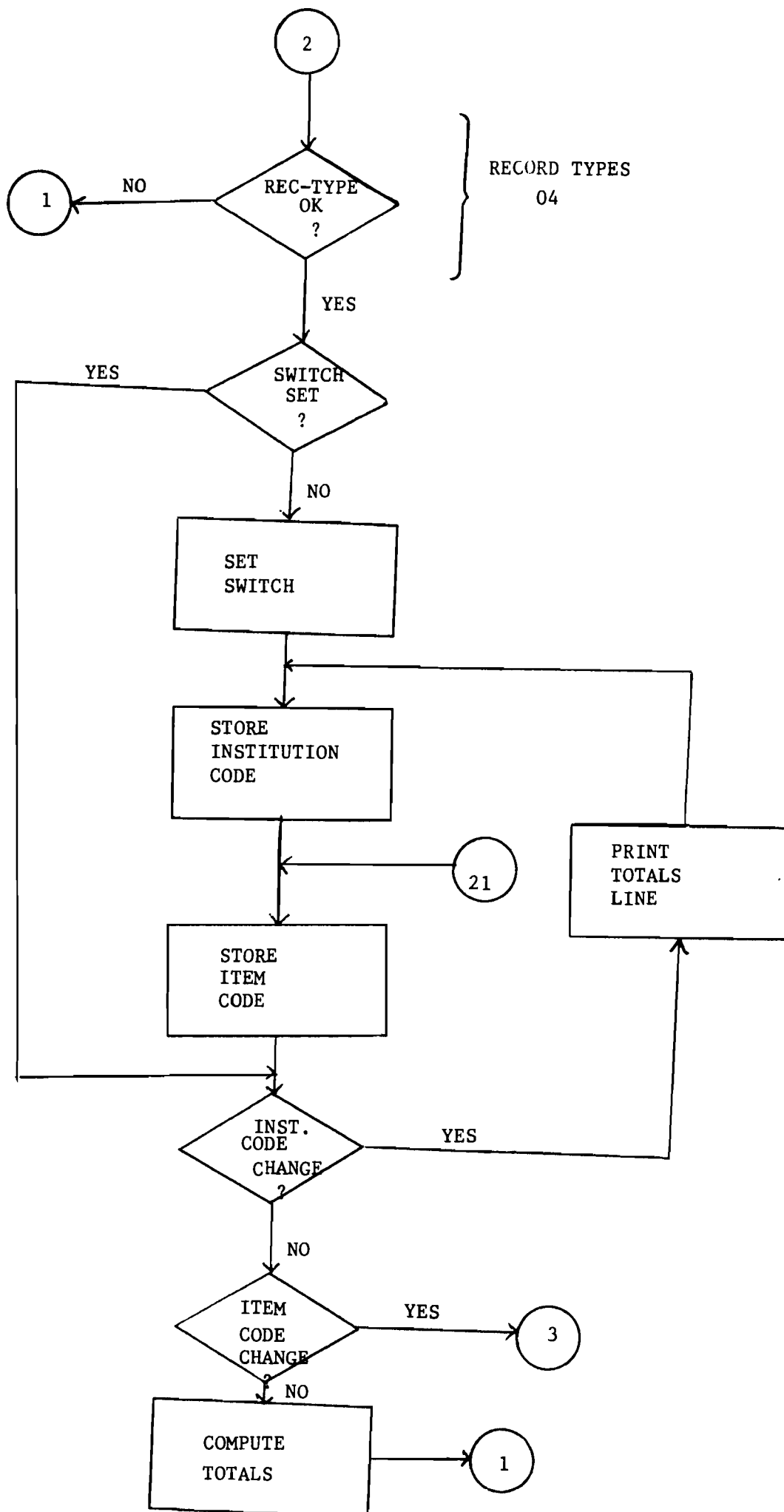
(b) Program Procedure

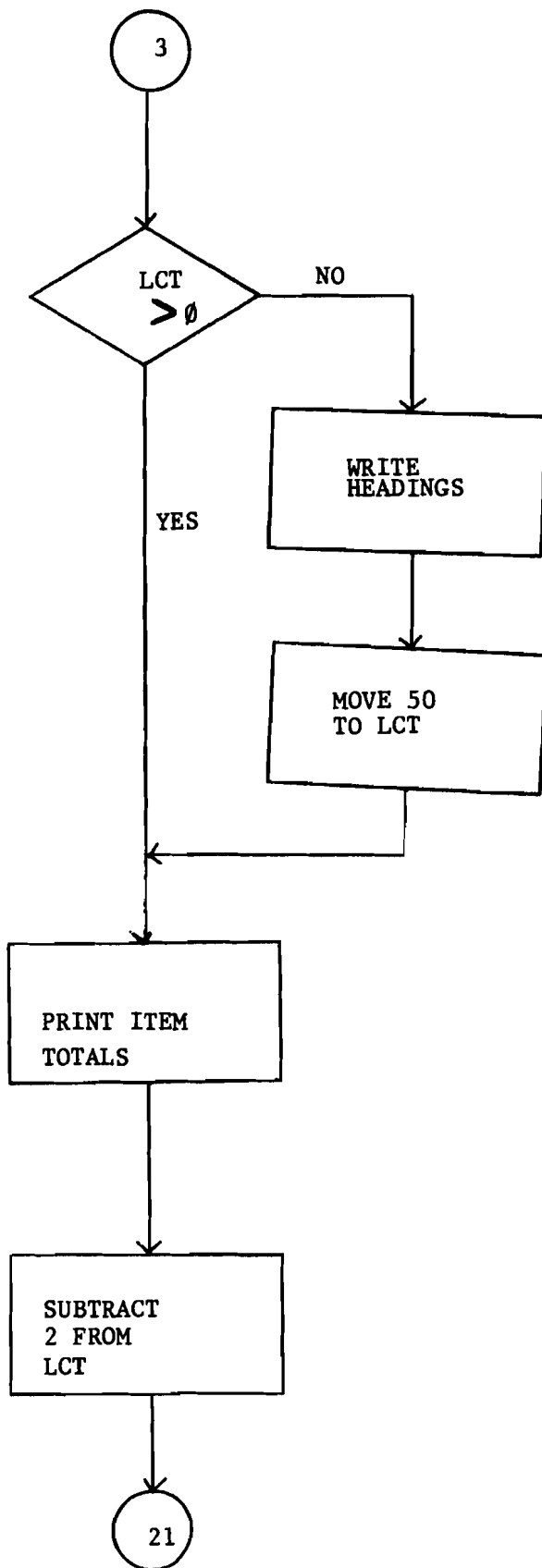
- 3.60 The program first accepts the parameter containing the table number and the subtitle of the table. The subtitle is moved to the relevant heading.

Then the program loads the institution table into working storage area using information read from institution dictionary file - RAARINST. Then the program proceeds to read the main data file - RAARDATA-ST10 from a magnetic tape, and selects record type 04 only. All other records are skipped. The program then accumulates items '000' and '050' as personal emoluments, and all other items as operational costs. If the parameter table number=1 Government institutions are selected, otherwise non- Government Institutions are selected. Expenditure totals by item are printed when the institution code changes. The program uses an item table of expenditure in working storage for printing the item code and item description.

(For program flowchart and listing refer to the following pages)







(d) PROGRAM LISTING - RAARP05

```
* $J JOB JNM=RAARP05,CLASS=A,USER=OPSO4000
// JOB RAARP05
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP05,*
// EXEC FCDBJL,SIZE=64K
CBL NOSEQ,CLIST, SXREF, FLOW=30, STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP05.
    AUTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
    SOURCE-COMPUTER. IBM-370.
    OBJECT-COMPUTER. IBM-370.
    SPECIAL-NAMES. COL IS NEWPAGE
                  SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DATAFILE ASSIGN TO SYS001-JT-3420-S.
    SELECT INST-FILE ASSIGN TO SYS025-UR-2501-S.
    SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.
  DATA DIVISION.
  FILE SECTION.
    FD DATAFILE RECORDING MODE IS F
      BLOCK CONTAINS 7000 CHARACTERS
      LABEL RECORDS ARE STANDARD
      DATA RECORD IS INREC.
    * VALUE OF ID IS 'RAARDATA'.
    01 INREC.
      02 FILLER PIC X(140).
    FD INST-FILE RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORDS IS INST-REC.
    * VALUE OF ID IS 'RAARINST'.
    01 INST-REC.
      02 INST-CODE PIC 9(03).
      02 FILLER PIC X.
      02 INST-NAME PIC X(63).
      02 FILLER PIC X(13).
    *
    FD PRINT-FL RECORDING MODE IS F
      LABEL RECORDS ARE OMITTED
      DATA RECORDS IS LP-REC.
    01 LP-REC.
      02 FILLER PIC X(133).
  WORKING-STORAGE SECTION.
    77 SW1 PIC 9 VALUE 0.
    77 LCT PIC 999 VALUE 0.
    77 PAGECT PIC 999 VALUE 0.
    77 CTR1 PIC 999 VALUE 0.
    77 CTR2 PIC 999 VALUE 0.
    *
    01 INST-CODE-S.
      02 ID-CODE-S PIC X(03).
      02 ID-NO-S REDEFINES ID-CODE-S PIC 999.
    01 INST-TABLE.
      02 TINST-CODE PIC X(03) OCCURS 150.
      02 TINST-NM PIC X(63) OCCURS 150.
      02 TMODE PIC X(03) OCCURS 999.
    01 FILLER.
      02 WITEM PIC X(03).
      02 WITEM1 REDEFINES WITEM PIC 999.
    01 ITEM-TOTALS.
      02 PROV-TOTAL PIC 9(10).
      02 USED-TOTAL PIC 9(10).
```

```

*
01 SJMM-TOTALS.
02 FILLER OCCURS 24.
03 SPROV-TOT PIC 9(10).
03 SUSED-TOT PIC 9(10).

*
01 INST-TOTALS.
02 IPRDV-TOT PIC 9(10).
02 IUSED-TOT PIC 9(10).

*
01 GRAND-TOTALS.
02 GPROV-TOT PIC 9(10).
02 GUSED-TOT PIC 9(10).
01 WORKREC.
02 RINST-CODE PIC X(03).
03 ROTHER-DK VALUE '042' THRU '046'
'052' THRU '060'
'099'.
02 FILLER PIC X(03).
02 RREC-TYPE PIC XX.
02 RREC-TP REDEFINES RREC-TYPE PIC 99.
02 RITEM-CODE PIC X(03).
02 FILLER PIC X(09).
02 REXP.
03 RPROVIDED PIC 9(07).
03 RUSED PIC 9(07).
02 FILLER PIC X(106).

*
01 PARA-CARD.
02 P-NO PIC X.
02 P-SYEAR PIC X(07).
02 P-HEAD-NM PIC X(40).
02 FILLER PIC X(32).

*
01 HEAD1.
02 FILLER PIC X(03) VALUE SPACES.
02 HDATE PIC X(08).
02 FILLER PIC X(14) VALUE SPACES.
02 FILLER PIC X(55) VALUE
'N A T I O N A L C O U N C I L F O R S C I E N C E'.
02 FILLER PIC X(30) VALUE
' A N D T E C H N O L O G Y'.
02 FILLER PIC X(11) VALUE SPACES.
02 FILLER PIC X(05) VALUE 'PAGE:'.
02 H1PAGE PIC ZZ9.
02 FILLER PIC X(04) VALUE SPACES.

*
01 HEAD2.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(45) VALUE
'RESOURCE ALLOCATION IN AGRICULTURAL RESEACH '.
02 FILLER PIC X(43) VALUE SPACES.

*
01 HEAD3.
02 FILLER PIC X(03) VALUE SPACES.
02 FILLER PIC X(07) VALUE 'TABLE '.
02 H3REPRT PIC XXX.
02 FILLER PIC X(32) VALUE SPACES.
02 FILLER PIC X(52) VALUE
'UTILIZATION OF FUNDS BY RESEARCH INSTITUTIONS AS AT '.
02 H3YEAR PIC X(07) VALUE SPACES.
02 FILLER PIC X(29) VALUE SPACES.

*
01 HEAD4.
02 FILLER PIC X(45) VALUE SPACES.
02 FILLER PIC X(60) VALUE ALL '-'.

```

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02 FILLER      PIC X(28)  VALUE SPACES.
*
01 HEAD5.
02 FILLER      PIC X(45)  VALUE SPACES.
02 H5HEAD      PIC X(40).
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(38)  VALUE
      'NOTE: --- = INFORMATION NOT AVAILABLE'.
02 FILLER      PIC X(05)  VALUE SPACES.
*
01 HEAD5A.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(40)  VALUE ALL '-'.
02 FILLER      PIC X(48)  VALUE SPACES.
*
01 HEAD6.
02 FILLER      PIC X(25)  VALUE SPACES.
02 FILLER      PIC X(25)  VALUE
      'INSTITUTION CODE & NAME :-'.
02 FILLER      PIC X(02)  VALUE SPACES.
02 H6INST-CODE PIC XXX.
02 FILLER      PIC XX    VALUE SPACES.
02 H6INST-VM   PIC X(63).
02 FILLER      PIC X(12)  VALUE SPACES.
*
01 HEAD7.
02 FILLER      PIC X(25)  VALUE SPACES.
02 FILLER      PIC X(27)  VALUE
      'CODE      ITEM OF EXPENDITURE'.
02 FILLER      PIC X(24)  VALUE SPACES.
02 FILLER      PIC X(08)  VALUE 'PROVIDED'.
02 FILLER      PIC X(07)  VALUE SPACES.
02 FILLER      PIC X(15)  VALUE 'USED %USED/PROV'.
02 FILLER      PIC X(26)  VALUE SPACES.
*
01 HEAD8.
02 FILLER      PIC X(25)  VALUE SPACES.
02 FILLER      PIC X(04)  VALUE ALL '-'.
02 FILLER      PIC X(04)  VALUE SPACES.
02 FILLER      PIC X(19)  VALUE ALL '-'.
02 FILLER      PIC X(24)  VALUE SPACES.
02 FILLER      PIC X(08)  VALUE ALL '-'.
02 FILLER      PIC X(07)  VALUE SPACES.
02 FILLER      PIC X(04)  VALUE ALL '-'.
02 FILLER      PIC X(02)  VALUE SPACES.
02 FILLER      PIC X(10)  VALUE ALL '-'.
02 FILLER      PIC X(25)  VALUE SPACES.
01 LINE1.
02 FILLER      PIC X(25).
02 LI-CODE     PIC X(03).
02 FILLER      PIC X(03).
02 LI-NAME     PIC X(40).
02 FILLER      PIC X(03).
02 LI-PROVD    PIC Z(9)9.
02 FILLER REDEFINES LI-PROVD.
03 FILLER      PIC X(07).
03 LI-PROVD-X  PIC X(03).
02 FILLER      PIC X.
02 LI-JSED     PIC Z(9)9.
02 FILLER REDEFINES LI-JSED.
03 FILLER      PIC X(07).
03 LI-JSED-X   PIC X(03).
02 FILLER      PIC X(05).
02 LI-PERCT    PIC ZZ9.
02 LI-PERCT-X  REDEFINES LI-PERCT PIC X(03).
02 FILLER      PIC X(29).

```



```

*
01 ITEM-TABLE.
02 FILLER PIC X(43) VALUE
   '000 PERSONAL EMOLUMENTS '
02 FILLER PIC X(43) VALUE
   '050 HOUSE ALLOWANCES '
02 FILLER PIC X(43) VALUE
   '100 TRANSPORT OPERATING EXPENSES '
02 FILLER PIC X(43) VALUE
   '110 TRAVELLING AND ACCOMMODATION EXPENSES '
02 FILLER PIC X(43) VALUE
   '120 POSTAL AND TELECOM EXPENSES '
02 FILLER PIC X(43) VALUE
   '140 ELECTRICITY WATER AND CONSERVANCY '
02 FILLER PIC X(43) VALUE
   '150 DRUGS SERA VACCINES AND PESTICIDES '
02 FILLER PIC X(43) VALUE
   '151 PURCHASE OF LIVESTOCK '
02 FILLER PIC X(43) VALUE
   '153 FARM INPUTS '
02 FILLER PIC X(43) VALUE
   '154 TRAINING AND SEMINARS '
02 FILLER PIC X(43) VALUE
   '160 FOOD AND RATIONS '
02 FILLER PIC X(43) VALUE
   '172 UNIFORMS AND CLOTHING '
02 FILLER PIC X(43) VALUE
   '173 LIBRARY EXPENSES '
02 FILLER PIC X(43) VALUE
   '174 STATIONERY AND PRINTING '
02 FILLER PIC X(43) VALUE
   '180 HIRING RENTS AND RATES '
02 FILLER PIC X(43) VALUE
   '190 MISCELLANEOUS AND OTHER CHARGES '
02 FILLER PIC X(43) VALUE
   '200 REPLACEMENT OF TRANSPORT '
02 FILLER PIC X(43) VALUE
   '210 ADDITIONAL TRANSPORT '
02 FILLER PIC X(43) VALUE
   '220 OFFICE EQUIPMENT '
02 FILLER PIC X(43) VALUE
   '222 PLANT AND EQUIPMENT '
02 FILLER PIC X(43) VALUE
   '250 MAINTENANCE OF STATIONS '
02 FILLER PIC X(43) VALUE
   '302 NATIONAL COOPERATIVE TRIALS '
02 FILLER PIC X(43) VALUE
   '340 GRANTS FOR COMMODITY RESEARCH '
01 FILLER REDEFINES ITEM-TABLE.
02 FILLER OCCURS 23.
   03 TITEM-CODE PIC X(03).
   03 FILLER PIC X.
   03 TITEM-NAME PIC X(39).

```

```

*
01 PERCTGE.
02 PERCTGE-X PIC XXX.
02 PERCTGE-9 REDEFINES PERCTGE-X PIC 999.
PROCEDURE DIVISION.
P-START.
OPEN INPUT DATAFILE
INST-FILE
OUTPUT PRINT-FL.
MOVE ZEROS TO ITEM-TOTALS
SUMM-TOTALS
INST-TOTALS
GRAND-TOTALS.

```

```

MOVE SPACES TO INST-TABLE
LINE1.
MOVE CURRENT-DATE TO HDATE.
MOVE 1 TO CTR2.
P-ACCEPT-PARA-CARD.
ACCEPT PARA-CARD FROM CREADER.
IF P-NO < '1' OR
P-NO > '5' OR
P-HEAD-VM = SPACES
DISPLAY 'PARAMETER ERR'
DISPLAY PARA-CARD STOP RUN.
MOVE P-HEAD-NM TO H5HEAD.
MOVE P-SYEAR TO H3YEAR.
IF P-NO = '1' MOVE '05A' TO H3REPORT.
IF P-NO = '2' MOVE '05B' TO H3REPORT.
IF P-NO = '3' MOVE '05C' TO H3REPORT.
IF P-NO = '4' MOVE '05D' TO H3REPORT.
IF P-NO = '5' MOVE '05E' TO H3REPORT.
P-READ-1.
READ INST-FILE AT END GO TO P-CLOSE-1.
IF CTR2 > 150 GO TO P-TABLE-FULL.
MOVE INST-CODE TO TINST-CODE (CTR2).
MOVE INST-NAME TO TINST-NM (CTR2).
MOVE CTR2 TO TMODE (INST-CODE).
ADD 1 TO CTR2.
GO TO P-READ-1.
*
P-TABLE-FULL.
DISPLAY 'INSTITUTION TABLE FULL'.
DISPLAY 'RUN ABANPONED'.
STOP RUN.
P-CLOSE-1.
CLOSE INST-FILE.
MOVE '999' TO TINST-CODE (CTR2).
MOVE 'S J M M A R Y T O T A L S' TO TINST-NM (CTR2).
MOVE CTR2 TO TMODE (999).
*
P-READ-2.
READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
IF RREC-TYPE NOT = '04' GO TO P-READ-2.
IF P-NO = '2' GO TO P-SELECT-OTHER.
IF ROTHER-JK GO TO P-READ-2.
P-R1.
IF SW1 = 1 GO TO P-COMPARE.
MOVE 1 TO SW1.
P-STORE-R3.
MOVE RINST-CODE TO ID-CODE-S.
P-STORE-R4.
MOVE RITEM-CODE TO WITEM.
P-COMPARE.
IF RINST-CODE NOT = ID-CODE-S GO TO P-INST-CHGE.
IF RITEM-CODE NOT = WITEM GO TO P-ITEM-CHGE.
EXAMINE REXP REPLACING ALL SPACES BY ZEROS.
ADD RPROVIDED TO PROV-TOTAL.
ADD RUSED TO USED-TOTAL.
GO TO P-READ-2.
P-SELECT-OTHER.
IF ROTHER-JK GO TO P-R1.
GO TO P-READ-2.
P-ITEM-CHGE.
*
PERFORM P-PRINT THRU P-PRINT-EXIT.
PERFORM P-SUMM THRU P-SUMM-EXIT.
ADD PROV-TOTAL TO IPROV-TOT.
ADD USED-TOTAL TO IUSED-TOT.
MOVE ZEROS TO ITEM-TOTALS.

```

```

*
P-ITEM-1.
  GO TO P-STORE-R4.
*
P-INST-CHGE.
*
  PERFORM P-ITEM-CHGE.
  MOVE 'TOTAL' TO L1NAME.
  IF IPROV-TOT = 0
    MOVE ALL '-' TO L1-PROVD-X
  ELSE
    MOVE IPROV-TOT TO L1-PROVD.
  IF IUSED-TOT = 0
    MOVE ALL '-' TO L1-USED-X
  ELSE
    MOVE IUSED-TOT TO L1-USED.
  IF IPROV-TOT = 0 MOVE 0 TO PERCTGE-9 ELSE
  COMPUTE PERCTGE-9 ROUNDED =
    (IUSED-TOT * 100) / IPROV-TOT.
  IF PERCTGE-9 = 0
    MOVE ALL '-' TO L1-PERCT-X
  ELSE
    MOVE PERCTGE-9 TO L1-PERCT.
  WRITE LP-REC FROM LINE1 AFTER 2.
  MOVE 0 TO LCT.
  MOVE SPACES TO LINE1.
  MOVE ZEROS TO INST-TOTALS.
*
P-INST-1. .
  GO TO P-STORE-R3.
P-PRINT.
  PERFORM P-HEAD THRU P-HEAD-EXIT.
  MOVE WITEM TO L1-CODE.
  PERFORM P-ITEM-DES THRU P-ITEM-EXIT.
  IF PROV-TOTAL = 0
    MOVE ALL '-' TO L1-PROVD-X
  ELSE
    MOVE PROV-TOTAL TO L1-PROVD.
  IF USED-TOTAL = 0
    MOVE ALL '-' TO L1-USED-X
  ELSE
    MOVE USED-TOTAL TO L1-USED.
  IF PROV-TOTAL = 0
    MOVE 0 TO PERCTGE-9 GO TO P-CTGE
  ELSE
    COMPUTE PERCTGE-9 ROUNDED =
      (USED-TOTAL * 100) / PROV-TOTAL.
P-CTGE.
  IF PERCTGE-9 = 0
    MOVE ALL '-' TO L1-PERCT-X
  ELSE
    MOVE PERCTGE-9 TO L1-PERCT.
  WRITE LP-REC FROM LINE1 AFTER 2.
  SUBTRACT 2 FROM LCT.
  MOVE SPACES TO LINE1.
P-PRINT-EXIT.
  EXIT.
P-ITEM-DES.
  MOVE 1 TO CTRL.
  MOVE SPACES TO L1NAME.
P-ITEM-S.
  IF CTRL > 23 MOVE 0 TO CTRL GO TO P-ITEM-EXIT.
  IF TITEM-CODE (CTRL) = WITEM
    MOVE TITEM-NAME (CTRL) TO L1NAME
  GO TO P-ITEM-EXIT.
  ADD 1 TO CTRL.

```

```

      GJ TO P-ITEM-S.
P-ITEM-EXIT.
      EXIT.
P-SUMM.
      IF CTR1 = 0
          ADD PROV-TOTAL TO SPRJV-TOT (24)
          ADD USED-TOTAL TO SUSED-TOT (24)
          GO TO P-SUMM-EXIT.
      ADD PROV-TOTAL TO SPROV-TOT (CTR1).
      ADD USED-TOTAL TO SUSED-TOT (CTR1).
P-SUMM-EXIT.
      EXIT.
P-HEAD.
      IF LCT > 0 GO TO P-HEAD-EXIT.
      ADD 1 TO PAGECT.
      MOVE PAGECT TO HIPAGE.
      WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
      WRITE LP-REC FROM HEAD2 AFTER 1.
      WRITE LP-REC FROM HEAD3 AFTER 2.
      WRITE LP-REC FROM HEAD4 AFTER 1.
      WRITE LP-REC FROM HEAD5 AFTER 1.
      WRITE LP-REC FROM HEAD5A AFTER 1.
      MOVE ID-NO-S TO H6INST-CODE.
      IF TMODE (ID-NO-S) = SPACES
          MOVE SPACES TO H6INST-NM GO TO P-HD.
      MOVE TMODE (ID-NO-S) TO CTR2.
      MOVE TINST-NM (CTR2) TO H6INST-NM.
P-HD.
      WRITE LP-REC FROM HEAD6 AFTER 2.
      WRITE LP-REC FROM HEAD7 AFTER 2.
      WRITE LP-REC FROM HEAD8 AFTER 1.
      MOVE 54 TO LCT.
P-HEAD-EXIT.
      EXIT.
*
P-CLOSE-2.
      PERFORM P-INST-CHGE.
      GJ TO P-END.
*
SUMMARY ROUTINE *****
      MOVE 0 TO LCT.
      MOVE 999 TO ID-NO-S.
      PERFORM P-HEAD THRU P-HEAD-EXIT.
      MOVE 1 TO CTR1.
      MOVE SPACES TO LINE1.
P-CL-1.
      IF CTR1 > 24 GO TO P-GRAND-TOTAL.
      MOVE SPRJV-TOT (CTR1) TO PRJV-TOTAL.
      MOVE SUSED-TOT (CTR1) TO USED-TOTAL.
      IF ITEM-TOTALS = ZEROS GO TO P-ADD-1.
      MOVE ITEM-CODE (CTR1) TO LI-CODE.
      MOVE ITEM-NAME (CTR1) TO LI-NAME.
      MOVE PROV-TOTAL TO LI-PROVD.
      MOVE USED-TOTAL TO LI-USED.
      COMPUTE PERCTGE-9 ROUNDED =
          (USED-TOTAL * 100) / PROV-TOTAL.
      MOVE PERCTGE-9 TO LI-PERCT.
      WRITE LP-REC FROM LINE1 AFTER 2.
      MOVE SPACES TO LINE1.
      ADD PRJV-TOTAL TO GPRJV-TOT.
      ADD USED-TOTAL TO GUSED-TOT.
P-ADD-1.
      ADD 1 TO CTR1.
      GJ TO P-CL-1.
P-GRAND-TOTAL.
      MOVE 'GRAND TOTAL ' TO LI-NAME.
      MOVE GPROV-TOT TO LI-PROVD.

```

```

        MOVE      GUSED-TOT      TO      LI-USED.
        COMPUTE    PERCTGE-9 ROUNDED =
                (GJSED-TDT * 100) / GPROV-TOT.
        MOVE PERCTGE-9      TO      LI-PERCT.
        WRITE      LP-REC  FROM  LINE1  AFTER 2.
P-END.
        CLOSE  DATAFILE
                PRINT-FL.
        STOP RUN.

/*
// LBLTYP  TAPE
// EXEC  LNKEDT
/&
*  ##  EDJ

```

(viii) PROGRAM RAARP06

(a) Program Description

3.61 This program produces table 06 which shows the current level of support to research projects in each institution. The record types selected from the main data file - RAARDATA-ST11 are 09, 10, 11, and 12. All other records are skipped.

- 3.62 Input:
- (1) Sorted main data file on magnetic tape labelled RAARDATA-ST11 (see 2.21 through 2.34)
 - (2) Project dictionary file also on magnetic tape and sorted by project number labelled RAARPROJ-ST02 (see 2.38)
 - (3) Institution dictionary file on diskette and loaded into the program as a card file labelled RAARINST (see 2.39)
 - (4) Parameter card - latest year of survey

Record types selected: 09, 10, 11, & 12.

Output: Printout:- TABLE 06 entitled 'Current level of support to Research Projects' (see Appendices II, III)

(b) Program Procedure

3.63 The program first reads RAARINST and loads the institution table in working storage area. Then the program proceeds to read Project dictionary file - RAARPROJ-ST02 and the main data file RAARDATA-ST11 sorted by project number.

The required record types 09, 10, 11, & 12 are extracted from RAARDATA-ST11.

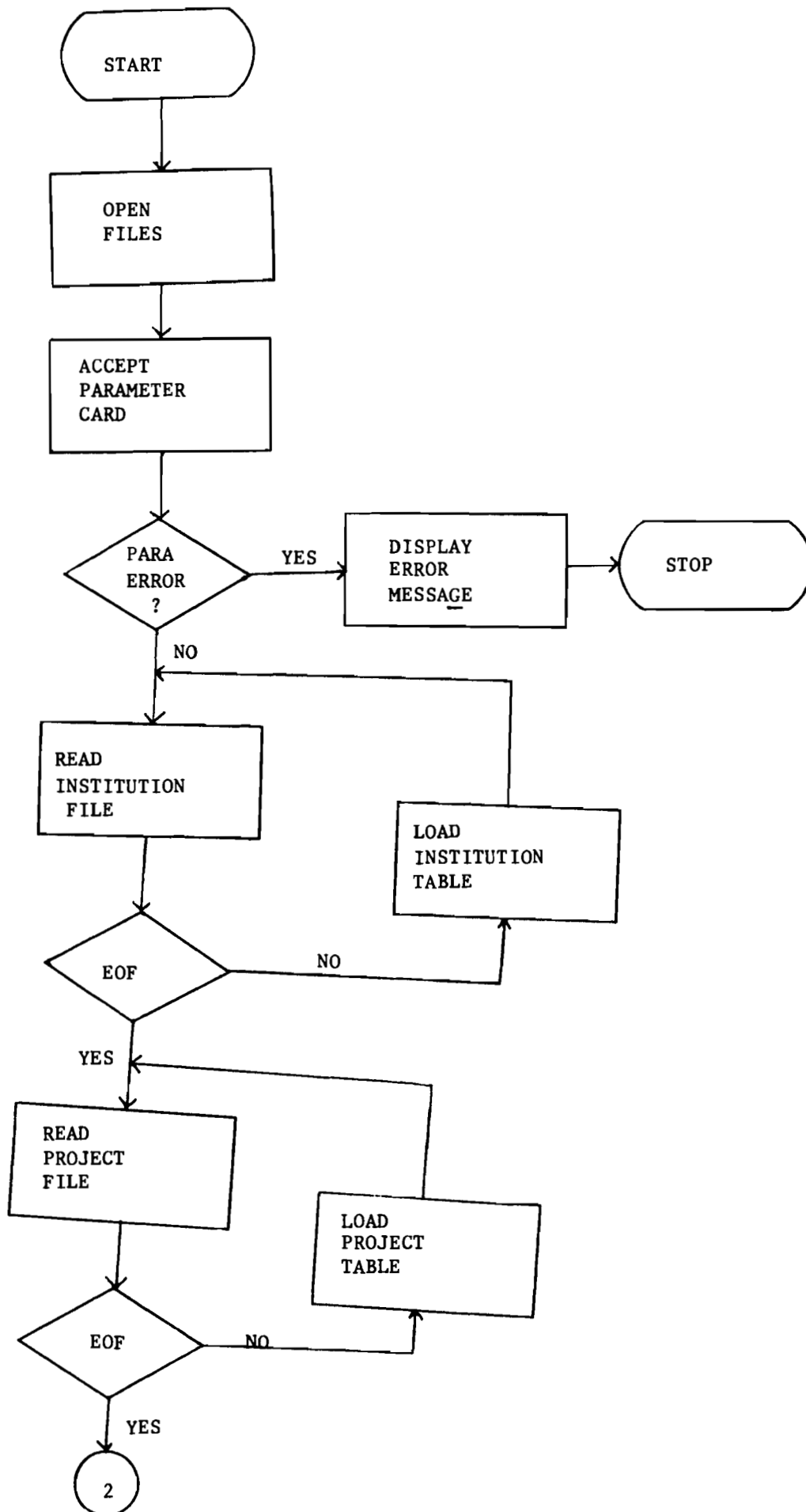
The program counts the number of research officers from record type 09 and it also picks information on total percentage time. From record type 10, the program picks the number of technical support staff; and the annual recurrent project cost from Record type 11. Record type 12 supplies the information in respect of the year the project started and the year the project was completed. If the year of completion is shown as space or zero the program assumes that the project is 'on-going'.

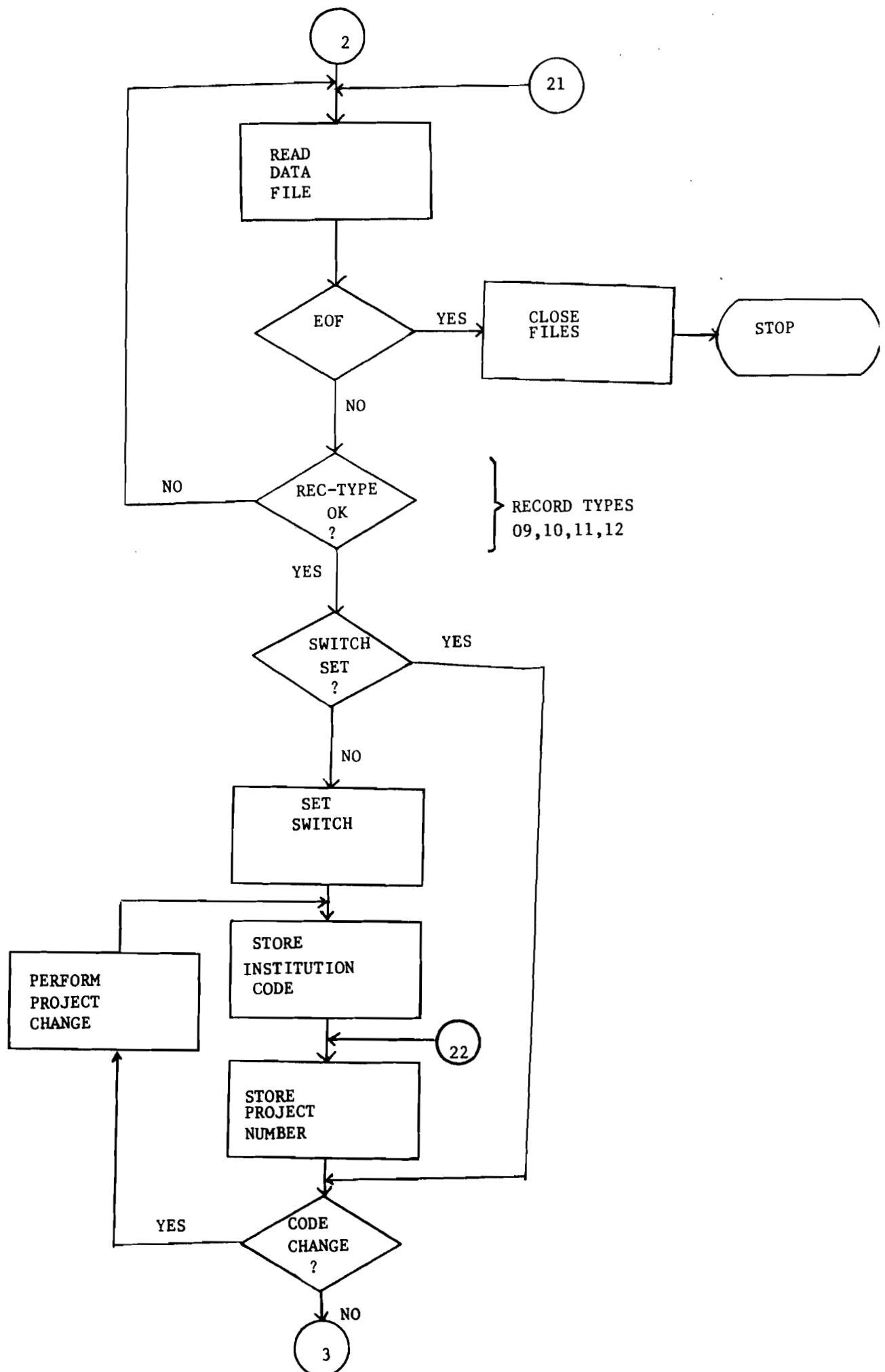
Totals are accumulated for each project using two controls - Institution code and project number.

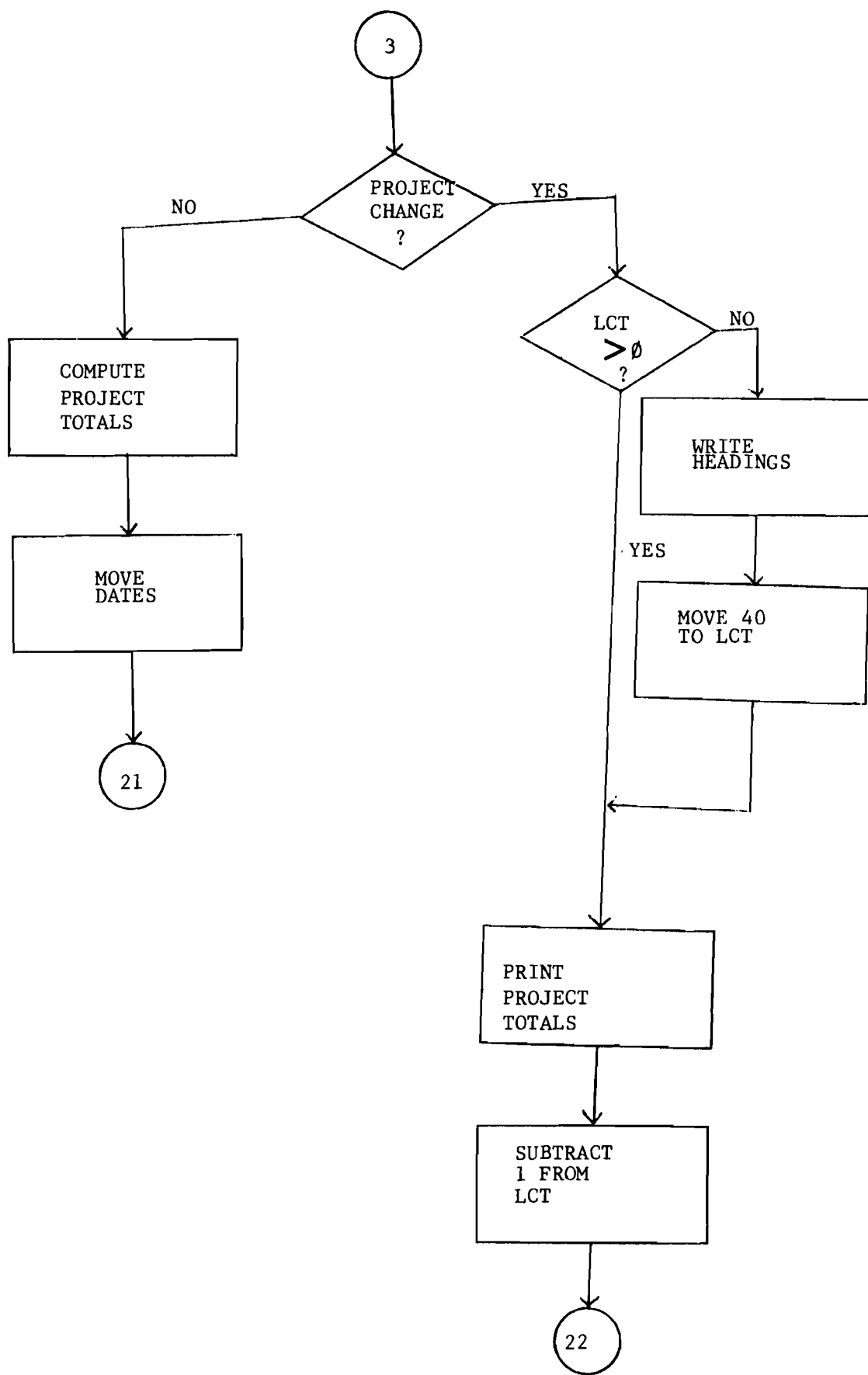
When the project changes the program prints totals for that project.

Institution name and code are printed in the heading using the institution table created at the beginning of the program. The heading routine is performed at the beginning of each page. The following pages give details of program flowchart and listing for this program.

(c) PROGRAM FLOW CHART - RAARPØ 6







(d) PROGRAM LISTING - RAARP06

* ** JOB JNM=RAARP06,CLASS=A,USER=JPS04000

// JOB RAARP06

// LIBDEF CL,TD=USRCL2

// OPTION CATAL

PHASE RAARP06,*

// EXEC FCDBJL,SIZE=54K

CBL NOSEQ,CLIST,SXREF,FLOW=30,STATE

IDENTIFICATION DIVISION.

PROGRAM-ID. RAARP06.

AUTHOR. CKC, AWK, AMK, NKM.

ENVIRONMENT DIVISION.

CONFIGURATION SECTION.

SOURCE-COMPUTER. IBM-370.

OBJECT-COMPUTER. IBM-370.

SPECIAL-NAMES. CO1 IS NEWPAGE

SYSIPT IS CREADER.

INPUT-OUTPUT SECTION.

FILE-CONTROL.

SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.

SELECT PROJ-FILE ASSIGN TO SYS002-UT-3420-S.

SELECT INST-FILE ASSIGN TO SYS025-UR-2501-S.

SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.

DATA DIVISION.

FILE SECTION.

FD DATAFILE RECORDING MODE IS F

BLOCK CONTAINS 7000 CHARACTERS

LABEL RECORDS ARE STANDARD

DATA RECORD IS INREC.

* VALUE OF ID IS 'RAARDATA'.

01 INREC.

02 FILLER PIC X(140).

FD INST-FILE RECORDING MODE IS F

LABEL RECORDS ARE OMITTED

DATA RECORDS IS INST-REC.

* VALUE OF ID IS 'RAARINST'.

01 INST-REC.

02 INST-CODE PIC 9(03).

02 FILLER PIC X.

02 INST-NAME PIC X(63).

02 FILLER PIC X(13).

*

FD PROJ-FILE RECORDING MODE IS F

BLOCK CONTAINS 8000 CHARACTERS

LABEL RECORDS ARE STANDARD

DATA RECORD IS PROJ-REC.

* VALUE OF ID IS 'PROJECT-FILE'.

01 PROJ-REC.

02 PROJ-CODE PIC X(15).

02 FILLER PIC X.

02 PROJ-NAME PIC X(64).

*

FD PRINT-FL RECORDING MODE IS F

LABEL RECORDS ARE OMITTED

DATA RECORDS IS LP-REC.

01 LP-REC.

02 FILLER PIC X(133).

WORKING-STORAGE SECTION.

77 SW1 PIC 9 VALUE 0.

77 LCT PIC 999 VALUE 0.

77 PAGECT PIC 999 VALUE 0.

77 CTR1 PIC 999 VALUE 0.

77 CTR2 PIC 999 VALUE 0.

01 PARA-CARD.

02 P-SYEAR PIC X(07).

02 FILLER PIC X(73).

```

*
01 INST-CODE-S.
02 ID-CODE-S PIC X(03).
02 ID-NO-S REDEFINES ID-CODE-S PIC 999.
01 INST-TABLE.
02 TINST-CODE PIC X(03) OCCURS 150.
02 TINST-NM PIC X(63) OCCURS 150.
02 TMODE PIC X(03) OCCURS 999.
01 FILLER.
02 WPROJ-NO PIC X(15).
02 WPROJ-NAME PIC X(60).
02 RPROJ-NO PIC X(15).
01 WORKREC.
02 WORKREC-09.
03 RINST-CODE PIC X(03).
03 FILLER PIC X(03).
03 RREC-TYPE PIC X(02).
03 FILLER PIC X(32).
03 PERCT-1 PIC X(03).
03 PERCT-12 REDEFINES PERCT-1 PIC 9(03).
03 FILLER PIC X(57).
03 PROG-NO PIC X(15).
03 PROJ-NO PIC X(15).
03 BATCH-NO PIC X(03).
03 FILLER PIC X(07).
*
02 WORKREC-10 REDEFINES WORKREC-09.
03 FILLER PIC X(08).
03 STAFF-X-1 PIC XX.
03 STAFF-9 REDEFINES STAFF-X-1 PIC 99.
03 FILLER PIC X(08).
03 STAFF-X-2 PIC XX.
03 STAFF-9-2 REDEFINES STAFF-X-2 PIC 99.
03 FILLER PIC X(08).
03 STAFF-X-3 PIC XX.
03 STAFF-9-3 REDEFINES STAFF-X-3 PIC 99.
03 FILLER PIC X(08).
03 STAFF-X-4 PIC XX.
03 STAFF-9-4 REDEFINES STAFF-X-4 PIC 99.
03 FILLER PIC X(103).
*
02 WORKREC-11 REDEFINES WORKREC-10.
03 FILLER PIC X(08).
03 RECURRENT-1.
04 PERS-1 PIC 9(07).
04 PERS-2 PIC 9(07).
04 OPER-1 PIC 9(07).
04 OPER-2 PIC 9(07).
03 FILLER PIC X(104).
*
02 WORKREC-12 REDEFINES WORKREC-11.
03 FILLER PIC X(19).
03 CAPITAL-CDST.
04 CAPITAL-1 PIC 9(06).
04 FILLER PIC X(11).
04 CAPITAL-2 PIC 9(06).
04 FILLER PIC X(11).
04 CAPITAL-3 PIC 9(06).
04 FILLER PIC X(11).
04 CAPITAL-4 PIC 9(06).
04 FILLER PIC X(11).
04 CAPITAL-5 PIC 9(06).
03 FILLER PIC X.
03 RDATE-1 PIC XX.
03 RDATE-2 PIC XX.
03 FILLER PIC X(42).

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01 TOTALS-A.
02 RD-TOTAL      PIC 9(04).
02 AV-TOTAL      PIC 9(04).
02 TECH-TOTAL    PIC 9(04).
02 COST-TOTAL    PIC 9(10).

*

01 DATE-STJRE.
02 START-DATE    PIC XX.
02 END-DATE      PIC XX.

*

01 HEAD1.
02 FILLER        PIC X(03) VALUE SPACES.
02 H1DATE        PIC X(08).
02 FILLER        PIC X(14) VALUE SPACES.
02 FILLER        PIC X(55) VALUE
    'N A T I O N A L C O U N C I L F O R S C I E N C E'.
02 FILLER        PIC X(30) VALUE
    ' A N D T E C H N O L O G Y'.
02 FILLER        PIC X(11) VALUE SPACES.
02 FILLER        PIC X(05) VALUE 'PAGE:'.
02 H1PAGE        PIC ZZ9.
02 FILLER        PIC X(04) VALUE SPACES.

*

01 HEAD2.
02 FILLER        PIC X(45) VALUE SPACES.
02 FILLER        PIC X(46) VALUE
    'RESOURCES ALLOCATION IN AGRICULTURAL RESEARCH'.
02 FILLER        PIC X(42) VALUE SPACES.

*

01 HEAD3.
02 FILLER        PIC X(03) VALUE SPACES.
02 FILLER        PIC X(07) VALUE 'TABLE '.
02 H3REPORT      PIC XX VALUE '06'.
02 FILLER        PIC X(33) VALUE SPACES.
02 FILLER        PIC X(52) VALUE
    'CURRENT LEVEL OF SUPPORT TO RESEARCH PROJECTS '.
02 H3YEAR        PIC X(07) VALUE SPACES.
02 FILLER        PIC X(29) VALUE SPACES.

*

01 HEAD4.
02 FILLER        PIC X(45) VALUE SPACES.
02 FILLER        PIC X(45) VALUE ALL '-'.
02 FILLER        PIC X(43) VALUE SPACES.

*
*

01 HEAD6.
02 FILLER        PIC X(25) VALUE SPACES.
02 FILLER        PIC X(26) VALUE
    'INSTITUTION CODE & NAME :-'.
02 FILLER        PIC X(02) VALUE SPACES.
02 H6INST-CODE   PIC XXX.
02 FILLER        PIC XX VALUE SPACES.
02 H6INST-VM     PIC X(63).
02 FILLER        PIC X(12) VALUE SPACES.

*

01 HEAD6A.
02 FILLER        PIC X(83) VALUE SPACES.
02 FILLER        PIC X(04) VALUE 'DATE'.
02 FILLER        PIC X(03) VALUE SPACES.
02 FILLER        PIC X(04) VALUE 'DATE'.
02 FILLER        PIC X(03) VALUE SPACES.
02 FILLER        PIC X(05) VALUE 'NO OF'.
02 FILLER        PIC X(02) VALUE SPACES.
02 FILLER        PIC X(04) VALUE 'AVE.'.
02 FILLER        PIC X(02) VALUE SPACES.
02 FILLER        PIC X(05) VALUE 'NO OF'.

```

```

02 FILLER      PIC X(02)  VALUE  SPACES.
02 FILLER      PIC X(12)  VALUE  'PROJECT COST'.
02 FILLER      PIC X(04)  VALUE  SPACES.
*
01 HEAD7.
02 FILLER      PIC X(03)  VALUE  SPACES.
02 FILLER      PIC X(14)  VALUE  'PROJECT NUMBER'.
02 FILLER      PIC X(04)  VALUE  SPACES.
02 FILLER      PIC X(36)  VALUE
    'P R O J E C T      T I T L E'.
02 FILLER      PIC X(26)  VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  'START'.
02 FILLER      PIC XX      VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  'ENDED'.
02 FILLER      PIC XX      VALUE  SPACES.
02 FILLER      PIC X(04)  VALUE  'R.O.'.
02 FILLER      PIC X(03)  VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  '%TIME'.
02 FILLER      PIC X      VALUE  SPACES.
02 FILLER      PIC X(04)  VALUE  'TECH'.
02 FILLER      PIC X(03)  VALUE  SPACES.
02 FILLER      PIC X(12)  VALUE  'KENYA POUNDS'.
02 FILLER      PIC X(04)  VALUE  SPACES.
01 HEAD8.
02 FILLER      PIC X(03)  VALUE  SPACES.
02 FILLER      PIC X(14)  VALUE  ALL '-'.
02 FILLER      PIC X(04)  VALUE  SPACES.
02 FILLER      PIC X(36)  VALUE  ALL '-'.
02 FILLER      PIC X(26)  VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  ALL '-'.
02 FILLER      PIC XX      VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  ALL '-'.
02 FILLER      PIC XX      VALUE  SPACES.
02 FILLER      PIC X(04)  VALUE  ALL '-'.
02 FILLER      PIC X(03)  VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  ALL '-'.
02 FILLER      PIC X      VALUE  SPACES.
02 FILLER      PIC X(04)  VALUE  ALL '-'.
02 FILLER      PIC X(03)  VALUE  SPACES.
02 FILLER      PIC X(09)  VALUE  ALL '-'.
02 FILLER      PIC X(07)  VALUE  SPACES.
*
01 HEAD9.
02 FILLER      PIC X(25)  VALUE  SPACES.
02 FILLER      PIC X(05)  VALUE  'NOTE:'.
02 FILLER      PIC X(04)  VALUE  SPACES.
02 FILLER      PIC X(31)  VALUE
    '--- = INFORMATION NOT AVAILABLE'.
02 FILLER      PIC X(68)  VALUE  SPACES.
*
01 LINE1.
02 FILLER      PIC X(03).
02 L1PROJ-NO    PIC X(15).
02 FILLER      PIC X(03).
02 L1TITLE      PIC X(60).
02 FILLER      PIC X(02).
02 START-DT.
03 L1DATE1      PIC X(02).
03 L1DATE12     PIC X(02).
02 FILLER      PIC X(03).
02 END-DT.
03 L1DATE2      PIC X(02).
03 L1DATE22     PIC X(02).
02 FILLER      PIC X(03).
02 L1R3         PIC ZZZ9.
02 L1R3-X REDEFINES L1R3 PIC X(04).

```

```

02 FILLER          PIC X(03).
02 LIAVE          PIC ZZ9.
02 LIAVE-X REDEFINES LIAVE PIC X(03).
02 FILLER          PIC X(03).
02 LITECH         PIC ZZ9.
02 FILLER          PIC X(02).
02 LICOST         PIC Z(09)9.
02 LIAMT REDEFINES LICOST.
    03 FILLER      PIC X(07).
    03 LI-COST     PIC X(03).
02 FILLER          PIC X(07).
*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT DATAFILE
           PROJ-FILE
           INST-FILE
    OUTPUT PRINT-FL.
    MOVE ZEROS TO TOTALS-A.
    MOVE 1 TO CTR2.
    MOVE CURREN-DATE TO HDATE.
    ACCEPT PARA-CARD FROM CREADER.
    IF P-SYEAR = SPACES
        DISPLAY 'PARA ERROR - RUN ABANDONED'
        STOP RUN.
    MOVE P-SYEAR TO H3YEAR.
P-READ-1.
    READ INST-FILE AT END GO TO P-CLOSE-1.
    IF CTR2 > 150 GO TO P-TABLE-FULL.
    MOVE INST-CODE TO TINST-CODE (CTR2).
    MOVE INST-NAME TO TINST-NM (CTR2).
    MOVE CTR2 TO TMODE (INST-CODE).
    ADD 1 TO CTR2.
    GO TO P-READ-1.
*
P-TABLE-FULL.
    DISPLAY 'INSTITUTION TABLE FULL'.
    DISPLAY 'RUN ABANDONED'.
    STOP RUN.
P-CLOSE-1.
    CLOSE INST-FILE.
    MOVE SPACES TO LINE1.
*
P-READ-PROJ.
    IF WPROJ-NO = HIGH-VALUES GO TO P-PROJ-EXIT.
    READ PROJ-FILE AT END CLOSE PROJ-FILE
    MOVE HIGH-VALUES TO WPROJ-NO GO TO P-PROJ-EXIT.
    MOVE PROJ-CODE TO WPROJ-NO.
P-PROJ-EXIT.
    EXIT.
*
P-READ-2.
    READ DATAFILE INTO WORKREC AT END GO TO P-CLOSE-2.
    IF RREC-TYPE = '09' OR
       RREC-TYPE = '10' OR
       RREC-TYPE = '11' OR
       RREC-TYPE = '12' GO TO P-R1
    ELSE GO TO P-READ-2.
P-R1.
    IF SW1 = 1 GO TO P-CJMPARE.
    MOVE 1 TO SW1.
P-STORE-R3.
    MOVE RINST-CODE TO ID-CODE-S.
    MOVE 0 TO LCT.
P-STORE-R4.
    MOVE PROJ-NO TO RPROJ-NO.

```

P-COMPARE.

```

IF RINST-CODE NOT = ID-CODE-S GO TO P-INST-CHANGE.
IF PROJ-NO NOT = RPROJ-NO GO TO P-PROJ-CHANGE.
IF RREC-TYPE = '09' GO TO P-RECORD-09.
IF RREC-TYPE = '10' GO TO P-RECORD-10.
IF RREC-TYPE = '11' GO TO P-RECORD-11.
GO TO P-RECORD-12.

```

*

P-RECORD-09.

```

ADD 1 TO RO-TOTAL.
EXAMINE PERCT-1 REPLACING ALL SPACES BY ZEROS.
ADD PERCT-12 TO AV-TOTAL.
GO TO P-READ-2.

```

*

P-RECORD-10.

```

EXAMINE STAFF-X-1 REPLACING ALL SPACES BY ZEROS.
EXAMINE STAFF-X-2 REPLACING ALL SPACES BY ZEROS.
EXAMINE STAFF-X-3 REPLACING ALL SPACES BY ZEROS.
EXAMINE STAFF-X-4 REPLACING ALL SPACES BY ZEROS.
ADD STAFF-9 TO TECH-TOTAL.
ADD STAFF-9-2 TO TECH-TOTAL.
ADD STAFF-9-3 TO TECH-TOTAL.
ADD STAFF-9-4 TO TECH-TOTAL.
GO TO P-READ-2.

```

*

P-RECORD-11.

```

EXAMINE RECURRENT-1 REPLACING ALL SPACES BY ZEROS.
ADD PERS-1 TO COST-TOTAL.
ADD PERS-2 TO COST-TOTAL.
ADD OPER-1 TO COST-TOTAL.
ADD OPER-2 TO COST-TOTAL.
GO TO P-READ-2.

```

*

P-RECORD-12.

```

MOVE RDATE-1 TO START-DATE.
MOVE RDATE-2 TO END-DATE.
GO TO P-READ-2.

```

*

P-PROJ-CHANGE.

```

PERFORM P-HEAD THRU P-HEAD-EXIT.
PERFORM P-PRINT THRU P-PRINT-EXIT.

```

P-PROJ-1.

*

```

GO TO P-STORE-R4.

```

*

P-INST-CHANGE.

```

PERFORM P-PROJ-CHANGE.
IF LCT > 0 WRITE LP-REC FROM HEAD9 AFTER 3.
GO TO P-STORE-R3.

```

*

P-PRINT.

```

IF RPROJ-NO > WPROJ-NO
  PERFORM P-READ-PROJ GO TO P-PRINT.
IF RPROJ-NO < WPROJ-NO
  MOVE SPACES TO WPROJ-NAME GO TO P-MOVE.
MOVE PROJ-NAME TO WPROJ-NAME.

```

P-MOVE.

```

MOVE RPROJ-NO TO LIPROJ-NO.
MOVE WPROJ-NAME TO LITITLE.
EXAMINE START-DATE REPLACING ALL SPACES BY ZEROS.
EXAMINE END-DATE REPLACING ALL SPACES BY ZEROS.
IF START-DATE = '00' MOVE ALL '-' TO LIDATE12
ELSE
  MOVE '19' TO LIDATE1 LIDATE12
  MOVE START-DATE TO LIDATE12.
IF END-DATE = '00' MOVE '-' TO END-DATE ELSE

```



```

      MOVE 'I9' TO L1DATE2
      MOVE END-DATE TO L1DATE22.
      IF RD-TOTAL = 0 MOVE ALL '-' TO L1RD-X L1AVE-X
      ELSE
      MOVE RD-TOTAL TO L1RD
      DIVIDE RD-TOTAL INTO AV-TOTAL GIVING L1AVE ROUNDED.
      MOVE TECH-TOTAL TO L1TECH.
      IF COST-TOTAL = 0 MOVE '---' TO L1-COST ELSE
      MOVE COST-TOTAL TO L1COST.
      WRITE LP-REC FROM LINE1 AFTER 2.
      SUBTRACT 2 FROM LCT.
      IF LCT = 0 WRITE LP-REC FROM HEAD9 AFTER 3.
      MOVE ZEROS TO TOTALS-A.
      MOVE SPACES TO LINE1.
*
      P-PRINT-EXIT.
      EXIT.
*
*
      P-HEAD.
      IF LCT > 0 GO TO P-HEAD-EXIT.
      ADD 1 TO PAGECT.
      MOVE PAGECT TO H1PAGE.
      WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
      WRITE LP-REC FROM HEAD2 AFTER 1.
      WRITE LP-REC FROM HEAD3 AFTER 2.
      WRITE LP-REC FROM HEAD4 AFTER 1.
      MOVE ID-NO-S TO H6INST-CODE.
      IF TMODE (ID-NO-S) = SPACES
      MOVE SPACES TO H6INST-NM GO TO P-HD.
      MOVE TMODE (ID-NO-S) TO CTR2.
      MOVE TINST-NM (CTR2) TO H6INST-NM.
      P-HD.
      WRITE LP-REC FROM HEAD6 AFTER 2.
      WRITE LP-REC FROM HEAD6A AFTER 2.
      WRITE LP-REC FROM HEAD7 AFTER 1.
      WRITE LP-REC FROM HEAD8 AFTER 1.
      MOVE 40 TO LCT.
      P-HEAD-EXIT.
      EXIT.
*
      P-CLOSE-2.
      CLOSE DATAFILE
      PROJ-FILE
      PRINT-FL.
      STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/*
* ** EODJ

```

(ix) PROGRAM RAARPO7

(a) Program Description

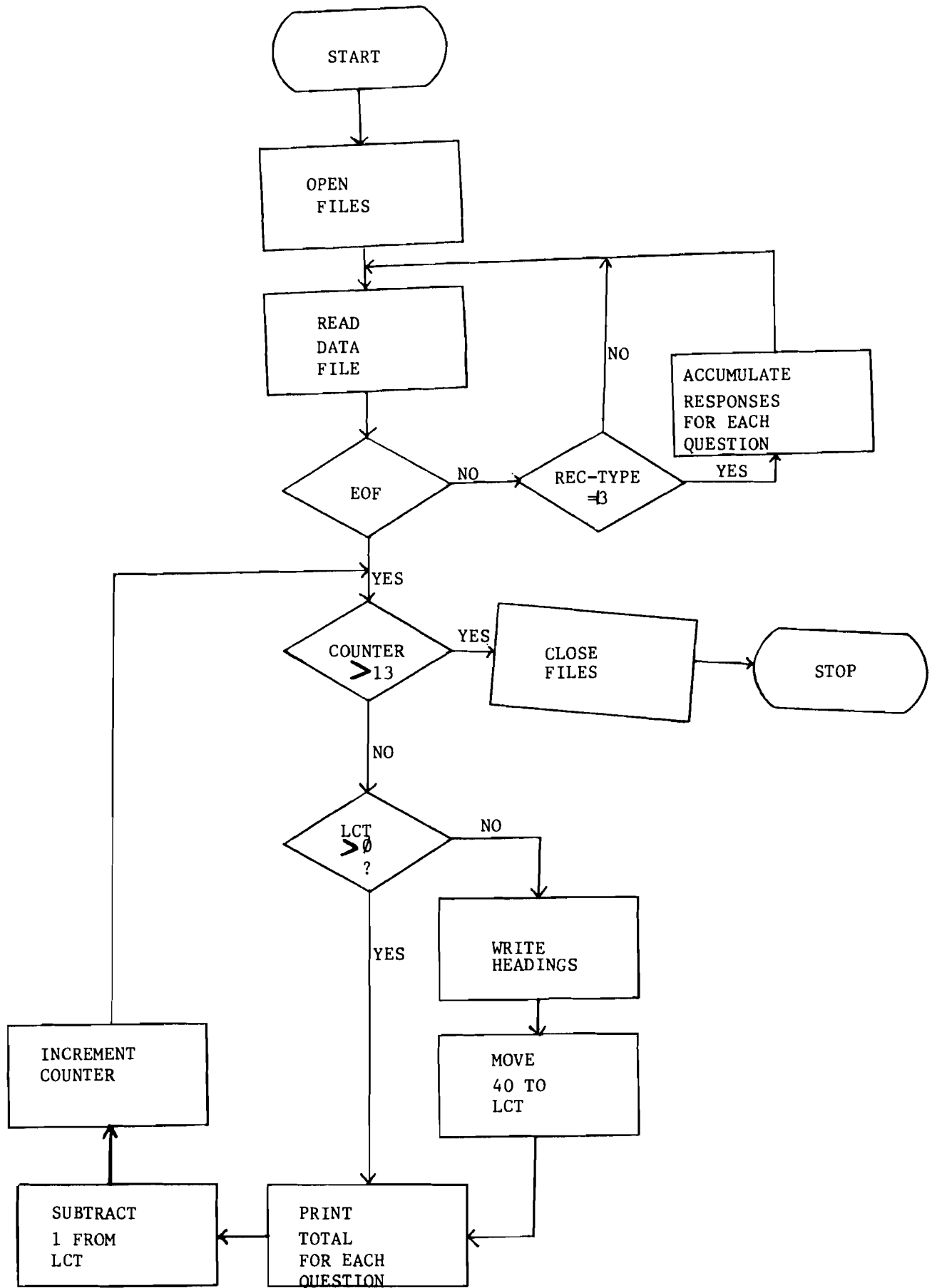
3.64 This program produces table 07 entitled 'Resources Management System', derived from record type 13 of Form C.

3.65 INPUT - The main data file on magnetic tape not sorted
labelled RAARDATA (see 2.21 through 2.34)
- Parameter card - latest year of survey

OUTPUT- Printout: TABLE 07 entitled 'Resource Management System'
(see Appendices II, III)
Record selected: 13

(b) Program Procedure

3.66 The program reads the unsorted main data file - RAARDATA and using record type 13, counts the number of 'yes' and No' responses for each possible answer to a given question. At the end of the main data file the questions and possible answers are printed together with the 'yes' and No' scores for each possible answer, the total number of interviewees, the total number of responses, plus the percentage affirmative. The pertinent program flowchart and listing follow hereafter.



(d) PROGRAM LISTING - RAARP07

```
* S& JOB JNM=RAARP07,CLASS=A,USER=OPS04000
// JOB RAARP07
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP07,*
// EXEC FCOBJL,SIZE=64K
CBL CLIST,FLOW=30,STATE
  IDENTIFICATION DIVISION.
  PROGRAM-ID. RAARP07.
  AUTHOR. CKC, AWK, AMK, NKM.
  ENVIRONMENT DIVISION.
  CONFIGURATION SECTION.
  SOURCE-COMPUTER. IBM-370.
  OBJECT-COMPUTER. IBM-370.
  SPECIAL-NAMES. CO1 IS NEWPAGE SYSIPT IS CREADER.
  INPUT-OUTPUT SECTION.
  FILE-CONTROL.
    SELECT DATAFILE ASSIGN TO SYS001-UT-3420-S.
    SELECT PRINT-FL ASSIGN TO SYS027-UR-1403-S.
  DATA DIVISION.
  FILE SECTION.
    FD DATAFILE RECORDING MODE IS F
      LABEL RECORDS ARE STANDARD
      BLOCK CONTAINS 7000 CHARACTERS
      DATA RECORD IS IN-REC.
    * VALUE OF ID IS 'RAARDA'.
    01 IN-REC.
      02 FILLER PIC X(140).
    *
    FD PRINT-FL
      LABEL RECORDS ARE OMITTED
      DATA RECORD IS LP-REC.
    01 LP-REC.
      02 FILLER PIC X(133).
    *
  WORKING-STORAGE SECTION.
    77 SUB PIC 99 VALUE 0.
    77 IND PIC 99 VALUE 0.
    77 PG-CTR PIC 999 VALUE 1.
    77 LINE-CTR PIC 999 VALUE 0.
    77 QZ-CTR PIC 99 VALUE 0.
    77 DESIG-CTR PIC 999 VALUE 0.
    01 TOTALS-1.
      02 TOT-RESP PIC 9(05).
    *
    01 PARA-CARD.
      02 P-YEAR PIC X(04).
      02 FILLER PIC X(76).
    01 WORKREC.
      02 INST-CODE PIC X(03).
      02 FILLER PIC X(03).
      02 REC-TP PIC XX.
      02 REC-TYPE REDEFINES REC-TP PIC 99.
      02 DESIG-INT PIC X.
      02 QUIZES.
        03 QZ-1 PIC 9 OCCURS 6.
        03 QZ-2 PIC 9 OCCURS 10.
        03 QZ-3 PIC 9 OCCURS 4.
        03 QZ-4 PIC 9 OCCURS 5.
        03 QZ-5 PIC 9 OCCURS 4.
        03 QZ-6 PIC 9 OCCURS 2.
        03 QZ-7 PIC 9 OCCURS 5.
        03 QZ-8 PIC 9 OCCURS 6.
        03 QZ-9 PIC 9 OCCURS 4.
        03 QZ-10 PIC 9 OCCURS 5.
```

```

03 QZ-11          PIC 9 OCCURS 4.
03 QZ-12          PIC 9 OCCURS 5.
03 QZ-13          PIC 9 OCCURS 3.
02 FILLER          PIC X(68).
*
01 LINE1.
02 FILLER          PIC XXX VALUE SPACES.
02 L1-QZND        PIC Z9.
02 FILLER          PIC X VALUE '.'.
02 FILLER          PIC X VALUE SPACES.
02 L1-QZ          PIC X(50).
02 FILLER          PIC X(76) VALUE SPACES.
*
01 LINE2.
02 FILLER          PIC X(07) VALUE SPACES.
02 L2-ND          PIC Z9.
02 FILLER          PIC X VALUE '.'.
02 L2-SUBND       PIC 99.
02 FILLER          PIC X VALUE SPACES.
02 L2-ALTANS      PIC X(30).
02 FILLER          PIC X(18) VALUE SPACES.
02 L2-Y           PIC ZZ9.
02 FILLER          PIC X(04) VALUE SPACES.
02 L2-N           PIC ZZ9.
02 FILLER          PIC X(07) VALUE SPACES.
02 L2-DESIGND     PIC ZZ9.
02 FILLER          PIC X(16) VALUE SPACES.
02 L2-TDT        PIC Z(4)9.
02 FILLER          PIC X(17) VALUE SPACES.
02 L2-PERCT       PIC ZZ9.
02 FILLER          PIC X(09) VALUE SPACES.
*
01 COUNTERS-1.
02 Y-CTR.
03 Y-ANS-1        PIC 999 OCCURS 6.
03 Y-ANS-2        PIC 999 OCCURS 10.
03 Y-ANS-3        PIC 999 OCCURS 4.
03 Y-ANS-4        PIC 999 OCCURS 5.
03 Y-ANS-5        PIC 999 OCCURS 4.
03 Y-ANS-6        PIC 999 OCCURS 2.
03 Y-ANS-7        PIC 999 OCCURS 5.
03 Y-ANS-8        PIC 999 OCCURS 6.
03 Y-ANS-9        PIC 999 OCCURS 4.
03 Y-ANS-10       PIC 999 OCCURS 5.
03 Y-ANS-11       PIC 999 OCCURS 4.
03 Y-ANS-12       PIC 999 OCCURS 5.
03 Y-ANS-13       PIC 999 OCCURS 3.
02 N-CTR.
03 N-ANS-1        PIC 999 OCCURS 6.
03 N-ANS-2        PIC 999 OCCURS 10.
03 N-ANS-3        PIC 999 OCCURS 4.
03 N-ANS-4        PIC 999 OCCURS 5.
03 N-ANS-5        PIC 999 OCCURS 4.
03 N-ANS-6        PIC 999 OCCURS 2.
03 N-ANS-7        PIC 999 OCCURS 5.
03 N-ANS-8        PIC 999 OCCURS 5.
03 N-ANS-9        PIC 999 OCCURS 4.
03 N-ANS-10       PIC 999 OCCURS 5.
03 N-ANS-11       PIC 999 OCCURS 4.
03 N-ANS-12       PIC 999 OCCURS 5.
03 N-ANS-13       PIC 999 OCCURS 3.
*
01 QUESTIONS.
02 FILLER          PIC X(50) VALUE
    'WHO DETERMINES RESEARCH PRIORITIES ?
02 FILLER          PIC X(50) VALUE

```

'ON WHAT BASIS ARE PRIORITIES DETERMINED ? '。
 02 FILLER PIC X(50) VALUE
 'HOW ARE RESEARCH FUNDS ALLOCATED ? '。
 02 FILLER PIC X(50) VALUE
 'TO WHOM ARE RESEARCH FUNDS ALLOCATED ? '。
 02 FILLER PIC X(50) VALUE
 'ARE RESEARCH FUNDS ALLOCATED CONSIDERED ? '。
 02 FILLER PIC X(50) VALUE
 'HOW ARE PRIORITIES RE-ASSIGNED IN BUDGET REDUCTION ? '。
 02 FILLER PIC X(50) VALUE
 'HOW OFTEN ARE PROJECTS EVALUATED ? '。
 02 FILLER PIC X(50) VALUE
 'WHO EVALUATES RESEARCH PROJECTS ? '。
 02 FILLER PIC X(50) VALUE
 'HOW OFTEN ARE RESEARCH STAFF EVALUATED ? '。
 02 FILLER PIC X(50) VALUE
 'WHO EVALUATES RESEARCH STAFF ? '。
 02 FILLER PIC X(50) VALUE
 'HOW IS THE PRODUCTIVE SCIENTISTS REWARDED ? '。
 02 FILLER PIC X(50) VALUE
 'HOW IS THE UNPRODUCTIVE SCIENTISTS DEALT WITH ? '。
 02 FILLER PIC X(50) VALUE
 'HOW ARE TEC STAFF RECRUITED, DEPLOYED & TRAINED ? '。
 01 QSTNS REDEFINES QUESTIONS。
 02 QTN PIC X(50) OCCURS 13.

*

01 ANSWERS-TAB.
 02 FILLER PIC X(30) VALUE
 'INDIVIDUAL SCIENTISTS '。
 02 FILLER PIC X(30) VALUE
 'PROGRAMME LEADERS '。
 02 FILLER PIC X(30) VALUE
 'TOP MANAGEMENT '。
 02 FILLER PIC X(30) VALUE
 'COMMITTEES OF MAN. & SCIENTIST '。
 02 FILLER PIC X(30) VALUE
 'DONOR AGENCIES '。
 02 FILLER PIC X(30) VALUE
 'OTHERS '。
 02 FILLER PIC X(30) VALUE
 'RESPONSE TO EMERGENCIES '。
 02 FILLER PIC X(30) VALUE
 'RESPONSE TO VALUE OF PRODUCT '。
 02 FILLER PIC X(30) VALUE
 'POTENTIAL FOR PRODUCTION '。
 02 FILLER PIC X(30) VALUE
 'IMPORT SUBSTITUTION '。
 02 FILLER PIC X(30) VALUE
 'FOREIGN EXCHANGE EARNINGS '。
 02 FILLER PIC X(30) VALUE
 'LAND UTILIZATION '。
 02 FILLER PIC X(30) VALUE
 'DONOR INFLUENCE '。
 02 FILLER PIC X(30) VALUE
 'SCIENTIFIC ADVANCEMENT '。
 02 FILLER PIC X(30) VALUE
 'DEVELOPMENT PLANS '。
 02 FILLER PIC X(30) VALUE
 'OTHERS '。
 02 FILLER PIC X(30) VALUE
 'QUARTERLY '。
 02 FILLER PIC X(30) VALUE
 'HALF YEARLY '。
 02 FILLER PIC X(30) VALUE
 'ANNUALLY '。
 02 FILLER PIC X(30) VALUE

	'PERIODS LONGER THAN ONE YEAR	'.
02 FILLER	PIC X(30) VALUE	
	'INDIVIDUAL SCIENTISTS	'.
02 FILLER	PIC X(30) VALUE	
	'PROJECTS	'.
02 FILLER	PIC X(30) VALUE	
	'PROGRAMMES	'.
02 FILLER	PIC X(30) VALUE	
	'SECTIONS	'.
02 FILLER	PIC X(30) VALUE	
	'STATIONS	'.
02 FILLER	PIC X(30) VALUE	
	'ADEQUATE	'.
02 FILLER	PIC X(30) VALUE	
	'ADEQUATE BUT IRREGULAR	'.
02 FILLER	PIC X(30) VALUE	
	'INADEQUATE	'.
02 FILLER	PIC X(30) VALUE	
	'VERY INADEQUATE	'.
02 FILLER	PIC X(30) VALUE	
	'SOME PROJECTS SUSPENDED	'.
02 FILLER	PIC X(30) VALUE	
	'FUNDS REDUCED PROPORTION PROJ.	'.
02 FILLER	PIC X(30) VALUE	
	'HALF YEARLY	'.
02 FILLER	PIC X(30) VALUE	
	'ANNUALLY	'.
02 FILLER	PIC X(30) VALUE	
	'EVERY 2-3 YEARS	'.
02 FILLER	PIC X(30) VALUE	
	'IRREGULARLY	'.
02 FILLER	PIC X(30) VALUE	
	'NO MECHANISM DEVELOPED	'.
02 FILLER	PIC X(30) VALUE	
	'TOP MANAGEMENT (EMPLOYER)	'.
02 FILLER	PIC X(30) VALUE	
	'RESEARCH DIRECTOR	'.
02 FILLER	PIC X(30) VALUE	
	'PROGRAMME LEADERS	'.
02 FILLER	PIC X(30) VALUE	
	'STANDING COMMITTEES	'.
02 FILLER	PIC X(30) VALUE	
	'AD-HOC COMMITTEES	'.
02 FILLER	PIC X(30) VALUE	
	'OTHERS	'.
02 FILLER	PIC X(30) VALUE	
	'ANNUALLY	'.
02 FILLER	PIC X(30) VALUE	
	'EVERY 2 YEARS	'.
02 FILLER	PIC X(30) VALUE	
	'IRREGULARLY	'.
02 FILLER	PIC X(30) VALUE	
	'NO FORMAL MECHANISM	'.
02 FILLER	PIC X(30) VALUE	
	'TOP MANAGEMENT (EMPLOYER)	'.
02 FILLER	PIC X(30) VALUE	
	'RESEARCH DIRECTOR	'.
02 FILLER	PIC X(30) VALUE	
	'PROGRAMME LEADERS	'.
02 FILLER	PIC X(30) VALUE	
	'SPECIAL COMMITTEES	'.
02 FILLER	PIC X(30) VALUE	
	'OTHERS (SPECIFY)	'.
02 FILLER	PIC X(30) VALUE	
	'ACCELERATED PROMOTION	'.
02 FILLER	PIC X(30) VALUE	

```

        *SPECIAL AWARDS (BONUS)          *.
02 FILLER      PIC X(30) VALUE
        *LETTER OF COMMENDATION          *.
02 FILLER      PIC X(30) VALUE
        *NO ACTION TAKEN                  *.
02 FILLER      PIC X(30) VALUE
        *NO PROMOTION                     *.
02 FILLER      PIC X(30) VALUE
        *DEMOTED                          *.
02 FILLER      PIC X(30) VALUE
        *TRANSFERRED                      *.
02 FILLER      PIC X(30) VALUE
        *DISMISSED                       *.
02 FILLER      PIC X(30) VALUE
        *NO ACTION TAKEN                  *.
02 FILLER      PIC X(30) VALUE
        *QUALIFIED STAFF ONLY             *.
02 FILLER      PIC X(30) VALUE
        *TRAINED ON THE JOB AT EMPL EXP*.
02 FILLER      PIC X(30) VALUE
        *AWARDED FELLOWSHIPS PRIORI      *.
01  ANS-TABLE REDEFINES ANSWERS-TAB.
02 ALT-ANS-1   PIC X(30) OCCURS 6.
02 ALT-ANS-2   PIC X(30) OCCURS 10.
02 ALT-ANS-3   PIC X(30) OCCURS 4.
02 ALT-ANS-4   PIC X(30) OCCURS 5.
02 ALT-ANS-5   PIC X(30) OCCURS 4.
02 ALT-ANS-6   PIC X(30) OCCURS 2.
02 ALT-ANS-7   PIC X(30) OCCURS 5.
02 ALT-ANS-8   PIC X(30) OCCURS 6.
02 ALT-ANS-9   PIC X(30) OCCURS 4.
02 ALT-ANS-10  PIC X(30) OCCURS 5.
02 ALT-ANS-11  PIC X(30) OCCURS 4.
02 ALT-ANS-12  PIC X(30) OCCURS 5.
02 ALT-ANS-13  PIC X(30) OCCURS 3.
*
01  HEAD1.
02 FILLER      PIC XXX VALUE SPACES.
02 H1DATE      PIC X(8).
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(48) VALUE
        *N A T I O N A L      C O U N C I L      F O R      *.
02 FILLER      PIC X(48) VALUE
        *S C I E N C E      A N D      T E C H N O L O G Y *.
02 FILLER      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(06) VALUE *PAGE:-*.
02 H1PAGE      PIC ZZ9.
02 FILLER      PIC XXX VALUE SPACES.
*
01  HEAD2.
02 FILLER      PIC X(33) VALUE SPACES.
02 FILLER      PIC X(44) VALUE
        *RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH*.
02 FILLER      PIC X(56) VALUE SPACES.
*
01  HEAD3.
02 FILLER      PIC XXX VALUE SPACES.
02 FILLER      PIC X(09) VALUE *TABLE 07*.
02 FILLER      PIC X(21) VALUE SPACES.
02 FILLER      PIC X(32) VALUE
        *RESOURCE MANAGEMENT SYSTEM AS OF*.
02 FILLER      PIC X(02) VALUE SPACES.
02 H3YEAR      PIC X(04) VALUE SPACES.
02 FILLER      PIC X(62) VALUE SPACES.
*
01  HEAD4.

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02 FILLER      PIC X(33) VALUE SPACES.
02 FILLER      PIC X(38) VALUE ALL '-'.
02 FILLER      PIC X(62) VALUE SPACES.
*
01 HEAD5.
02 FILLER      PIC X(03) VALUE SPACES.
02 FILLER      PIC X(31) VALUE
      'QUESTIONS AND MULTIPLE ANSWERS'.
02 FILLER      PIC X(46) VALUE SPACES.
02 FILLER      PIC X(06) VALUE 'NO. OF'.
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(12) VALUE 'TOTAL NO. OF'.
02 FILLER      PIC X(10) VALUE SPACES.
02 FILLER      PIC X(13) VALUE '% AFFIRMATIVE'.
02 FILLER      PIC X(12) VALUE SPACES.
*
01 HEAD6.
02 FILLER      PIC X(61) VALUE SPACES.
02 FILLER      PIC X(03) VALUE 'YES'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE 'NO '.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(12) VALUE 'INTERVIEWEES'.
02 FILLER      PIC X(07) VALUE SPACES.
02 FILLER      PIC X(16) VALUE 'ANSWERS OBTAINED'.
02 FILLER      PIC X(21) VALUE SPACES.
*
01 HEAD7.
02 FILLER      PIC X(03) VALUE SPACES.
02 FILLER      PIC X(31) VALUE ALL '-'.
02 FILLER      PIC X(27) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(03) VALUE ALL '-'.
02 FILLER      PIC X(05) VALUE SPACES.
02 FILLER      PIC X(12) VALUE ALL '-'.
02 FILLER      PIC X(07) VALUE SPACES.
02 FILLER      PIC X(16) VALUE ALL '-'.
02 FILLER      PIC X(06) VALUE SPACES.
02 FILLER      PIC X(13) VALUE ALL '-'.
02 FILLER      PIC X(02) VALUE SPACES.
*
PROCEDURE DIVISION.
P-START.
    OPEN INPUT    DATAFILE
      OUTPUT PRINT-FL.
    MOVE ZEROS TO COUNTERS-1 TOTALS-1.
    MOVE CURRENT-DATE TO HDATE.
    ACCEPT PARA-CARD FROM CREADER.
    IF P-YEAR NOT NUMERIC
        DISPLAY 'PARA ERROR - RUN ABANDONED'
        STOP RUN.
    MOVE P-YEAR TO H3YEAR.
*
P-READ.
    READ DATAFILE INTO WORKREC AT END GO TO P-PRINT.
    IF REC-TP NOT NUMERIC GO TO P-READ.
    IF REC-TYPE NOT = 13 GO TO P-READ.
    MOVE 1 TO QZ-CTR.
    ADD 1 TO DESIG-CTR.
    EXAMINE QUIZES REPLACING ALL SPACES BY ZEROS.
P-CHECK.
    IF QZ-CTR > 13 GO TO P-READ.
P-MOVE.
    IF QZ-CTR = 1 OR
       QZ-CTR = 8 MOVE 6 TO SUB.

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IF QZ-CTR = 2 MOVE 10 TO SUB.
IF QZ-CTR = 3 OR
  QZ-CTR = 5 OR
  QZ-CTR = 9 OR
  QZ-CTR = 11 MOVE 4 TO SUB.
IF QZ-CTR = 4 OR
  QZ-CTR = 7 OR
  QZ-CTR = 10 OR
  QZ-CTR = 12 MOVE 5 TO SUB.
IF QZ-CTR = 6 MOVE 2 TO SUB.
IF QZ-CTR = 13 MOVE 3 TO SUB.
P-CHK-C.
  PERFORM P-LOOP THRU P-LOOP-EXIT.
  ADD 1 TO QZ-CTR.
  GO TO P-CHECK.
*
P-LOOP.
  IF SUB < 1 GO TO P-LOOP-EXIT.
  GO TO P-QZ-1 P-QZ-2 P-QZ-3 P-QZ-4 P-QZ-5
    P-QZ-6 P-QZ-7 P-QZ-8 P-QZ-9 P-QZ-10
    P-QZ-11 P-QZ-12 P-QZ-13 DEPENDING ON QZ-CTR.
*
P-QZ-1.
  IF QZ-1 (SUB) = 1 ADD 1 TO Y-ANS-1 (SUB) ELSE
    ADD 1 TO N-ANS-1 (SUB).
  GO TO P-LP-CONTINUE.
P-QZ-2.
  IF QZ-2 (SUB) = 1 ADD 1 TO Y-ANS-2 (SUB) ELSE
    ADD 1 TO N-ANS-2 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-3.
  IF QZ-3 (SUB) = 1 ADD 1 TO Y-ANS-3 (SUB) ELSE
    ADD 1 TO N-ANS-3 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-4.
  IF QZ-4 (SUB) = 1 ADD 1 TO Y-ANS-4 (SUB) ELSE
    ADD 1 TO N-ANS-4 (SUB).
  GO TO P-LP-CONTINUE.
P-QZ-5.
  IF QZ-5 (SUB) = 1 ADD 1 TO Y-ANS-5 (SUB) ELSE
    ADD 1 TO N-ANS-5 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-6.
  IF QZ-6 (SUB) = 1 ADD 1 TO Y-ANS-6 (SUB) ELSE
    ADD 1 TO N-ANS-6 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-7.
  IF QZ-7 (SUB) = 1 ADD 1 TO Y-ANS-7 (SUB) ELSE
    ADD 1 TO N-ANS-7 (SUB).
  GO TO P-LP-CONTINUE.
P-QZ-8.
  IF QZ-8 (SUB) = 1 ADD 1 TO Y-ANS-8 (SUB) ELSE
    ADD 1 TO N-ANS-8 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-9.
  IF QZ-9 (SUB) = 1 ADD 1 TO Y-ANS-9 (SUB) ELSE
    ADD 1 TO N-ANS-9 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-10.
  IF QZ-10 (SUB) = 1 ADD 1 TO Y-ANS-10 (SUB) ELSE

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      ADD 1 TO N-ANS-10 (SUB).
      GO TO P-LP-CONTINUE.
*
P-QZ-11.
  IF QZ-11 (SUB) = 1 ADD 1 TO Y-ANS-11 (SUB) ELSE
    ADD 1 TO N-ANS-11 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-12.
  IF QZ-12 (SUB) = 1 ADD 1 TO Y-ANS-12 (SUB) ELSE
    ADD 1 TO N-ANS-12 (SUB).
  GO TO P-LP-CONTINUE.
*
P-QZ-13.
  IF QZ-13 (SUB) = 1 ADD 1 TO Y-ANS-13 (SUB) ELSE
    ADD 1 TO N-ANS-13 (SUB).
P-LP-CONTINUE.
  SUBTRACT 1 FROM SUB.
  GO TO P-LDOP.
P-LDOP-EXIT.
  EXIT.
*
P-PRINT.
  PERFORM P-HEADINGS THRU P-HEAD-EXIT.
  MOVE 1 TO QZ-CTR.
P-CHECK-13.
  IF QZ-CTR > 13 GO TO P-CLOSE.
  PERFORM P-PRINT-QUIZ THRU P-QUIZ-EXIT.
  PERFORM P-MOVE.
  MOVE 1 TO IND.
  MOVE QZ-CTR TO L2-ND.
  PERFORM P-PRT-LOOP THRU P-PRT-LP-EXIT.
  ADD 1 TO QZ-CTR.
  GO TO P-CHECK-13.
*
P-PRT-LOOP.
  IF IND > SUB GO TO P-PRT-LP-EXIT.
  MOVE IND TO L2-SUBND.
  GO TO P-PRT-01 P-PRT-02 P-PRT-03 P-PRT-04 P-PRT-05
    P-PRT-06 P-PRT-07 P-PRT-08 P-PRT-09 P-PRT-10
    P-PRT-11 P-PRT-12 P-PRT-13 DEPENDING ON QZ-CTR.
*
P-PRT-01.
  MOVE ALT-ANS-1 (IND) TO L2-ALTANS.
  MOVE Y-ANS-1 (IND) TO L2-Y.
  MOVE N-ANS-1 (IND) TO L2-N.
  MOVE DESIG-CTR TO L2-DESIGNO.
  ADD Y-ANS-1 (IND) N-ANS-1 (IND) GIVING TOT-RESP.
  MOVE TOT-RESP TO L2-TOT.
  COMPUTE L2-PERCT ROUNDED =
    (Y-ANS-1 (IND) / TOT-RESP) * 100.
  GO TO P-PRT-C.
P-PRT-02.
  MOVE ALT-ANS-2 (IND) TO L2-ALTANS.
  MOVE Y-ANS-2 (IND) TO L2-Y.
  MOVE N-ANS-2 (IND) TO L2-N.
  MOVE DESIG-CTR TO L2-DESIGNO.
  ADD Y-ANS-2 (IND) N-ANS-2 (IND) GIVING TOT-RESP.
  MOVE TOT-RESP TO L2-TOT.
  COMPUTE L2-PERCT ROUNDED =
    (Y-ANS-2 (IND) / TOT-RESP) * 100.
  GO TO P-PRT-C.
P-PRT-03.
  MOVE ALT-ANS-3 (IND) TO L2-ALTANS.
  MOVE Y-ANS-3 (IND) TO L2-Y.
  MOVE N-ANS-3 (IND) TO L2-N.

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      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-3  (IND) N-ANS-3  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-3  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.
P-PRT-04.
      MOVE ALT-ANS-4  (IND) TO L2-ALTANS.
      MOVE Y-ANS-4    (IND) TO L2-Y.
      MOVE N-ANS-4    (IND) TO L2-N.
      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-4  (IND) N-ANS-4  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-4  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.
P-PRT-05.
      MOVE ALT-ANS-5  (IND) TO L2-ALTANS.
      MOVE Y-ANS-5    (IND) TO L2-Y.
      MOVE N-ANS-5    (IND) TO L2-N.
      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-5  (IND) N-ANS-5  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-5  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.
P-PRT-06.
      MOVE ALT-ANS-6  (IND) TO L2-ALTANS.
      MOVE Y-ANS-6    (IND) TO L2-Y.
      MOVE N-ANS-6    (IND) TO L2-N.
      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-6  (IND) N-ANS-6  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-6  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.
P-PRT-07.
      MOVE ALT-ANS-7  (IND) TO L2-ALTANS.
      MOVE Y-ANS-7    (IND) TO L2-Y.
      MOVE N-ANS-7    (IND) TO L2-N.
      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-7  (IND) N-ANS-7  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-7  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.
P-PRT-08.
      MOVE ALT-ANS-8  (IND) TO L2-ALTANS.
      MOVE Y-ANS-8    (IND) TO L2-Y.
      MOVE N-ANS-8    (IND) TO L2-N.
      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-8  (IND) N-ANS-8  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-8  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.
P-PRT-09.
      MOVE ALT-ANS-9  (IND) TO L2-ALTANS.
      MOVE Y-ANS-9    (IND) TO L2-Y.
      MOVE N-ANS-9    (IND) TO L2-N.
      MOVE DESIG-CTR          TO L2-DESIGNO.
      ADD Y-ANS-9  (IND) N-ANS-9  (IND) GIVING TOT-RESP.
      MOVE TOT-RESP TO L2-TOT.
      COMPUTE L2-PERCT ROUNDED =
          (Y-ANS-9  (IND) / TOT-RESP) * 100.
      GO TO P-PRT-C.

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P-PRT-10.
  MOVE ALT-ANS-10 (IND) TO L2-ALTANS.
  MOVE Y-ANS-10   (IND) TO L2-Y.
  MOVE N-ANS-10   (IND) TO L2-N.
  MOVE DESIG-CTR      TO L2-DESIGNO.
  ADD Y-ANS-10 (IND) N-ANS-10 (IND) GIVING TOT-RESP.
  MOVE TOT-RESP TO L2-TOT.
  COMPUTE L2-PERCT ROUNDED =
    (Y-ANS-10 (IND) / TOT-RESP) * 100.
  GO TO P-PRT-C.
P-PRT-11.
  MOVE ALT-ANS-11 (IND) TO L2-ALTANS.
  MOVE Y-ANS-11   (IND) TO L2-Y.
  MOVE N-ANS-11   (IND) TO L2-N.
  MOVE DESIG-CTR      TO L2-DESIGNO.
  ADD Y-ANS-11 (IND) N-ANS-11 (IND) GIVING TOT-RESP.
  MOVE TOT-RESP TO L2-TOT.
  COMPUTE L2-PERCT ROUNDED =
    (Y-ANS-11 (IND) / TOT-RESP) * 100.
  GO TO P-PRT-C.
P-PRT-12.
  MOVE ALT-ANS-12 (IND) TO L2-ALTANS.
  MOVE Y-ANS-12   (IND) TO L2-Y.
  MOVE N-ANS-12   (IND) TO L2-N.
  MOVE DESIG-CTR      TO L2-DESIGNO.
  ADD Y-ANS-12 (IND) N-ANS-12 (IND) GIVING TOT-RESP.
  MOVE TOT-RESP TO L2-TOT.
  COMPUTE L2-PERCT ROUNDED =
    (Y-ANS-12 (IND) / TOT-RESP) * 100.
  GO TO P-PRT-C.
P-PRT-13.
  MOVE ALT-ANS-13 (IND) TO L2-ALTANS.
  MOVE Y-ANS-13   (IND) TO L2-Y.
  MOVE N-ANS-13   (IND) TO L2-N.
  MOVE DESIG-CTR      TO L2-DESIGNO.
  ADD Y-ANS-13 (IND) N-ANS-13 (IND) GIVING TOT-RESP.
  MOVE TOT-RESP TO L2-TOT.
  COMPUTE L2-PERCT ROUNDED =
    (Y-ANS-13 (IND) / TOT-RESP) * 100.
P-PRT-C.
  PERFORM P-HEADINGS THRU P-HEAD-EXIT.
  WRITE LP-REC FROM LINE2 AFTER 2.
  SUBTRACT 2 FROM LINE-CTR.
  ADD 1 TO IND.
  GO TO P-PRT-LOOP.
P-PRT-LP-EXIT.
  EXIT.
*
P-HEADINGS.
  IF LINE-CTR > 1 GO TO P-HEAD-EXIT.
  MOVE PG-CTR TO H1PAGE.
  WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
  WRITE LP-REC FROM HEAD2 AFTER 1.
  WRITE LP-REC FROM HEAD3 AFTER 2.
  WRITE LP-REC FROM HEAD4 AFTER 1.
  WRITE LP-REC FROM HEAD5 AFTER 2.
  WRITE LP-REC FROM HEAD6 AFTER 1.
  WRITE LP-REC FROM HEAD7 AFTER 1.
  ADD 1 TO PG-CTR.
  MOVE 40 TO LINE-CTR.
P-HEAD-EXIT.
  EXIT.
*
P-PRINT-QUIZ.
  PERFORM P-HEADINGS THRU P-HEAD-EXIT.
  MOVE Q7-CTR TO I1-Q7NN.

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        MOVE QTN (QZ-CTR) TO L1-QZ.
        WRITE LP-REC FROM LINE1 AFTER 2.
        SUBTRACT 2 FROM LINE-CTR.
P-QJIZ-EXIT.
        EXIT.
*
        P-CLOSE.
        CLOSE DATAFILE PRINT-FL.
        STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/8
* 88 E0J

```

(x) PROGRAM RAARP08

(a) Program Description

3.67 This program extracts record type 12, and produces two printouts containing information on major laboratory equipment. The printouts give the Code number of the equipment name, the quantity and the condition.

3.68 INPUT: (1) The main data file on magnetic tape sorted by institution labelled RAARDA-T12 (see 2.21 through 2.34)

(2) The equipment dictionary file also on magnetic tape labelled RAAREQUP-DATA (See 2.41)

(3) The institution dictionary file on floppy diskette loaded onto the program as a card file (see 2.36)

(4) Parameter card - Latest year of survey

Record Type selected :12

Output: (1) Printout:- TABLE 08A entitled 'Analysis of Major Scientific Equipment Main Data File Record Type 12 1979/80'

(2) Printout: TABLE 08B entitled 'Location and Condition of Major Laboratory Equipment 1979/80. (see Appendices II, III)'

(b) Program Procedure

3.69 The program first reads the institution dictionary file and loads the institution table in working storage. Then the program proceeds to read the equipment dictionary file and also loads it in working storage area.

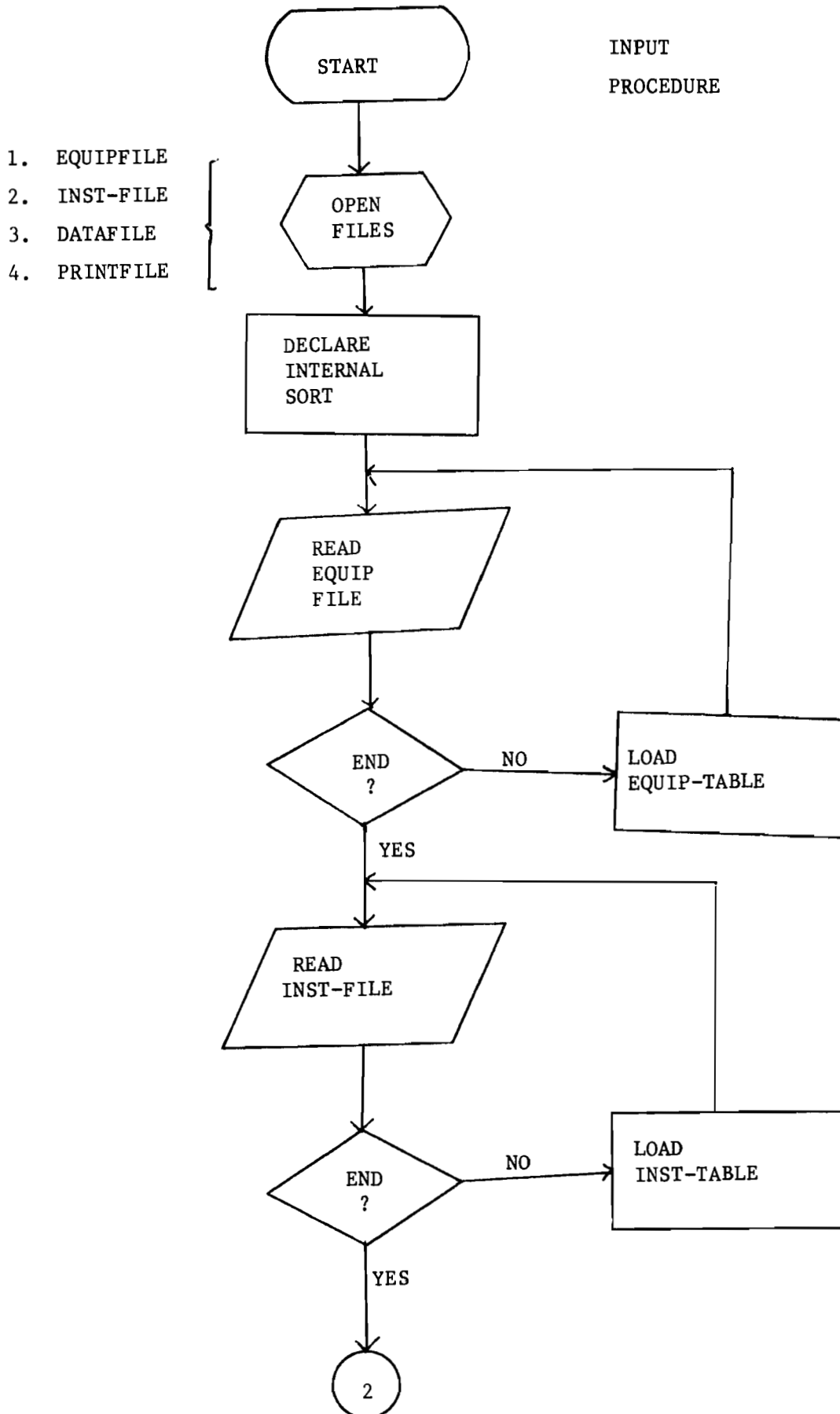
After loading the two files in table form the program reads the main data file and extracts the required data from record type 12.

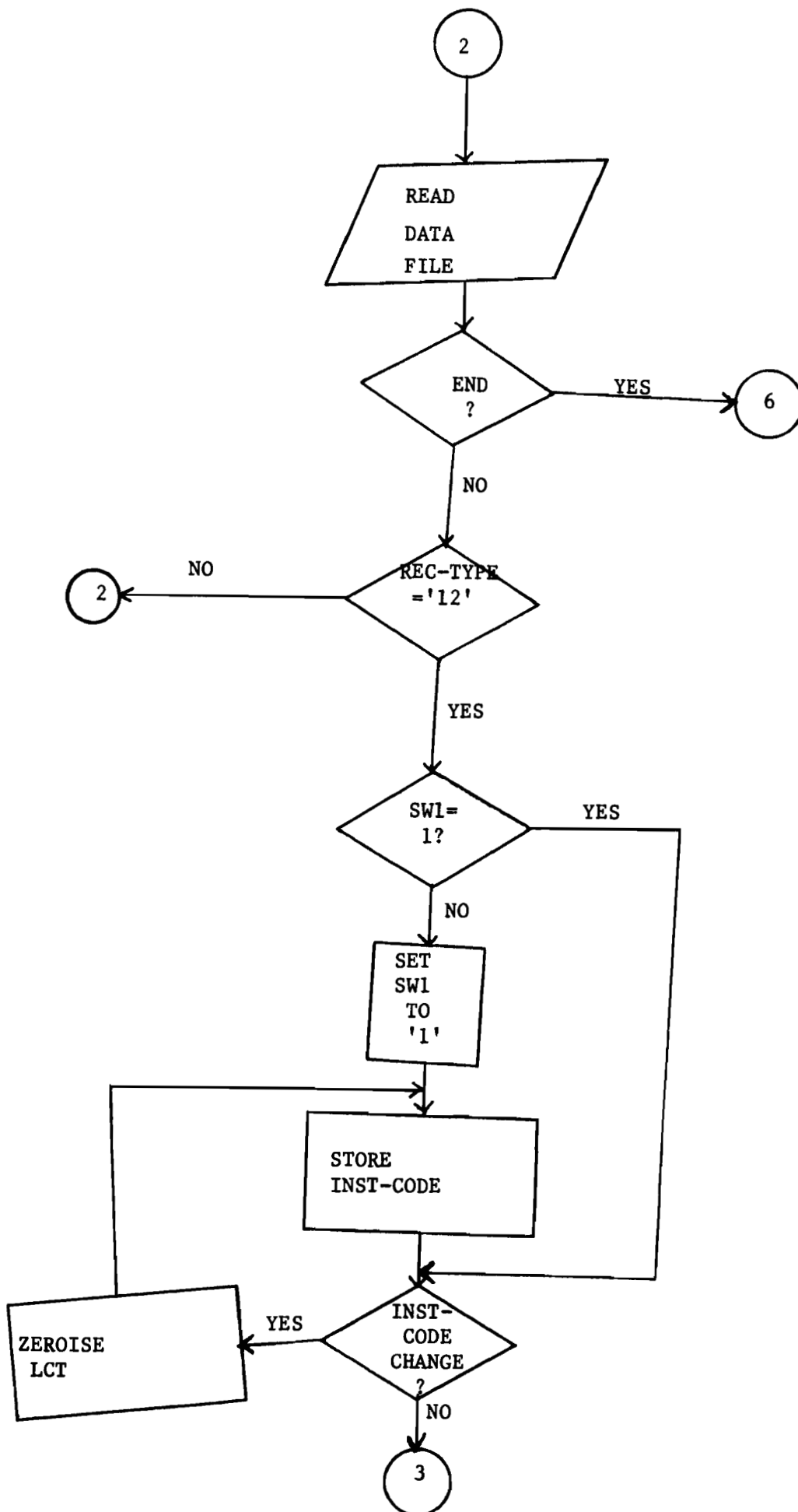
Record type 12 contains five fields for five possible types of equipment.

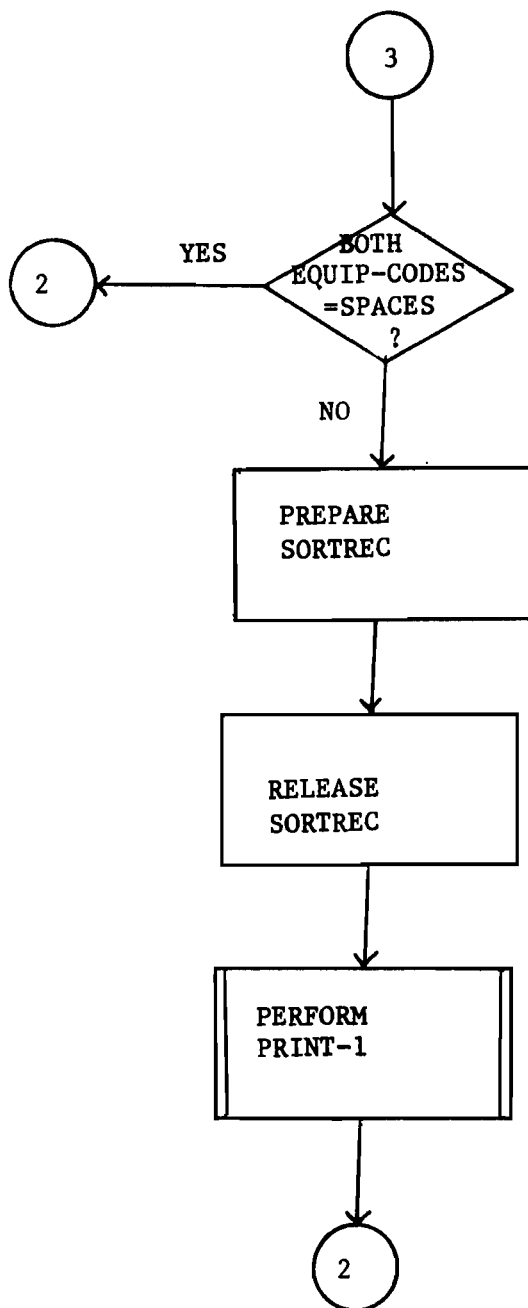
The program tests the five fields and if they are found to contain spaces, the record is ignored and the program reads the next record from the main data file. Otherwise all the fields containing data are listed to produce Table Ø8A.

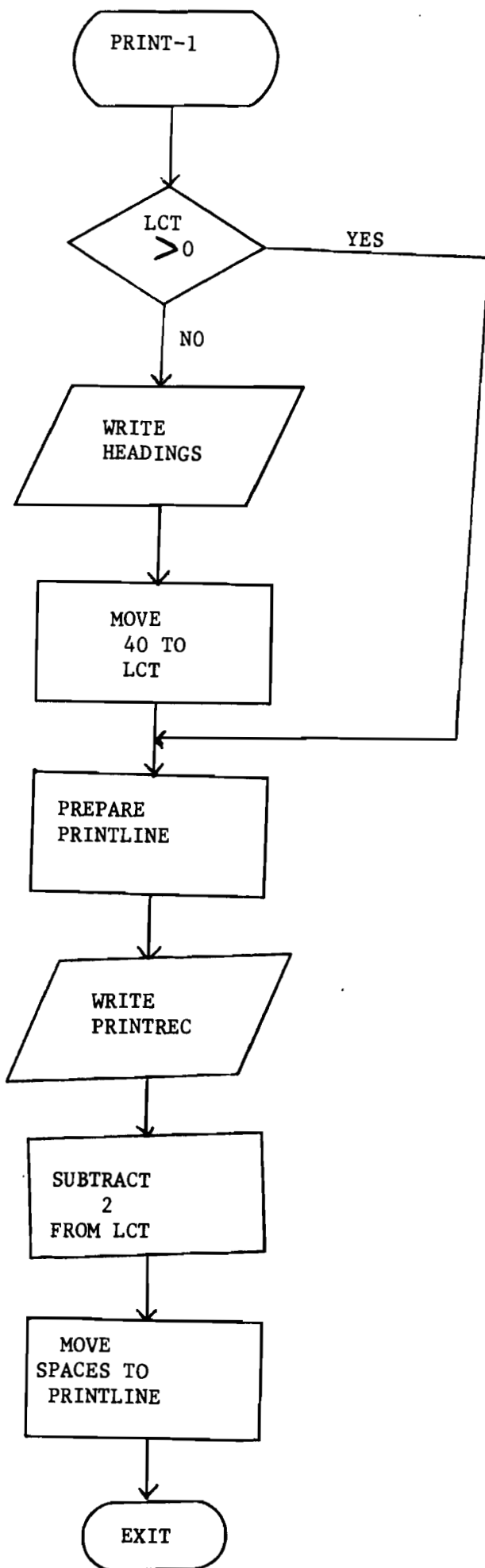
The fields containing data are also written onto disk sort work area for internal sorting by institution code, and equipment code and condition. The program recalls the sorted records to produce Table Ø8B.

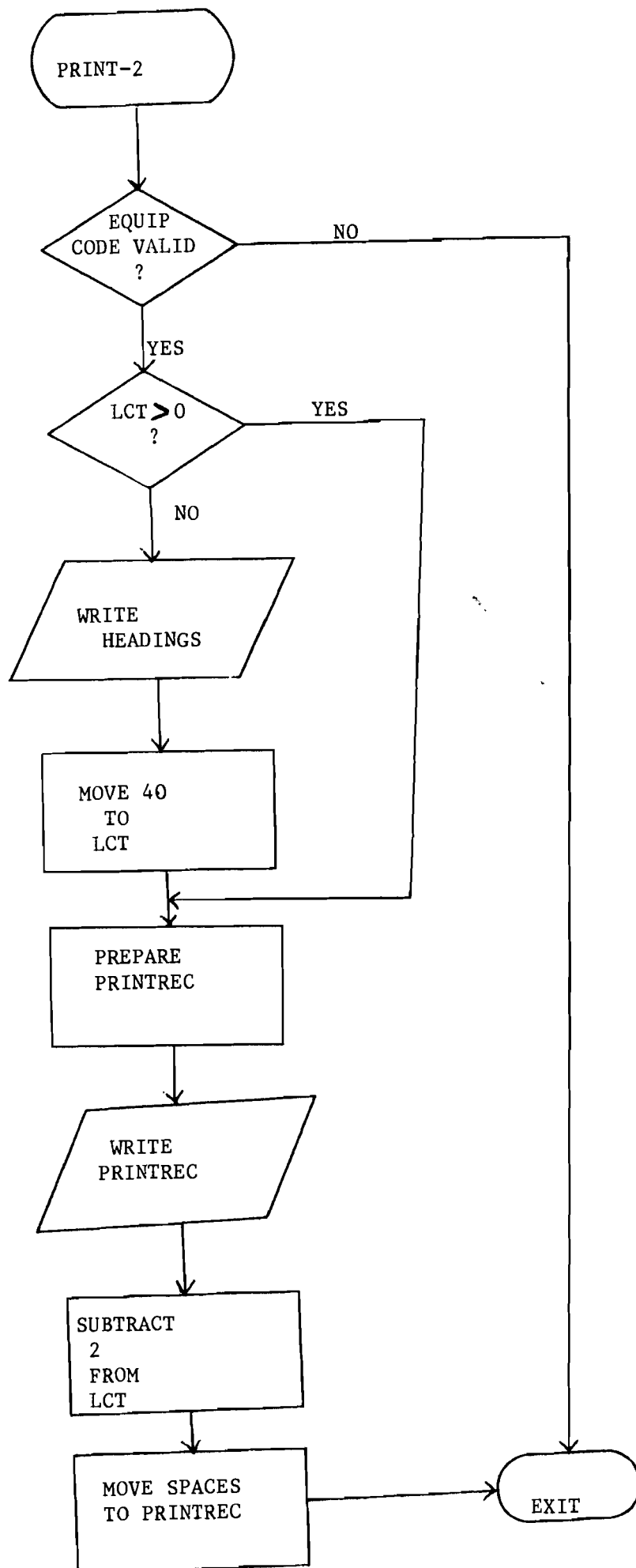
To produce the above Tables Ø8A and Ø8B, the program also obtains the institution name from the institution table, the equipment description from the equipment table and equipment condition from an extra table built in the program. The relevant program flowchart and listing are outlined in the ensuing pages.



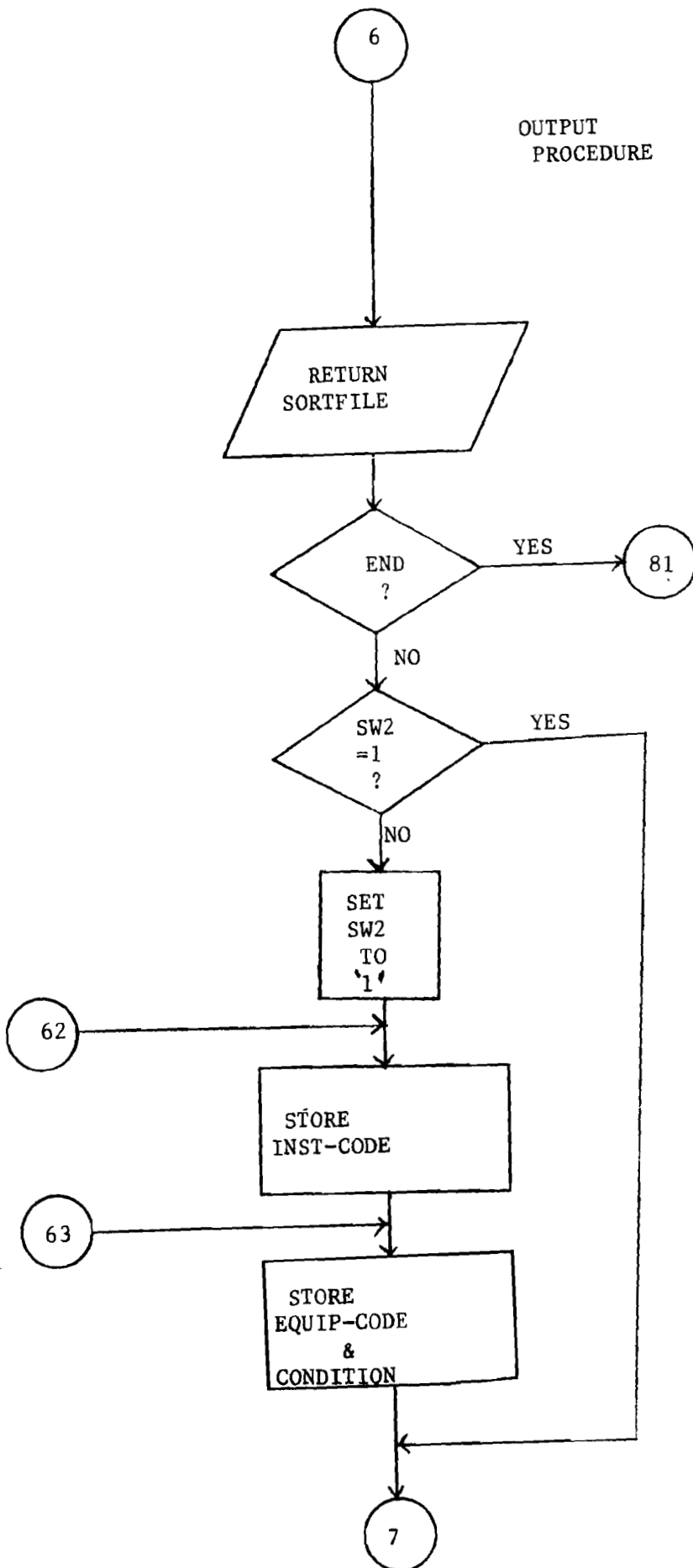


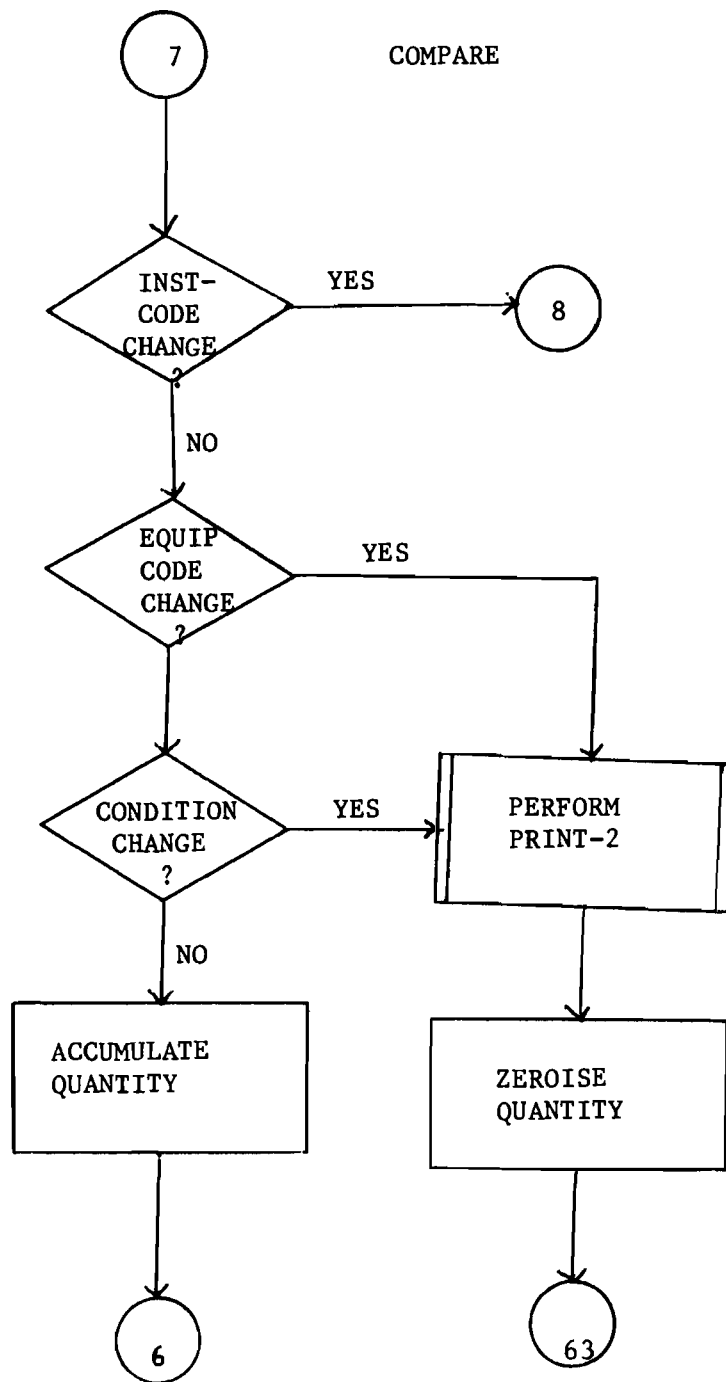


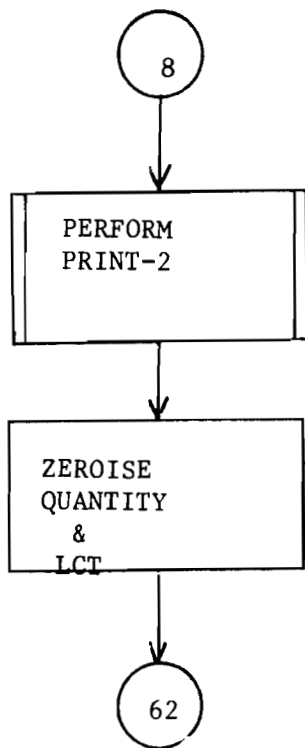




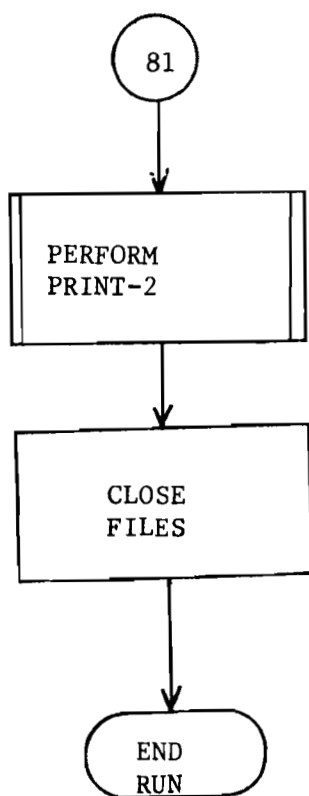
OUTPUT
PROCEDURE







CHANGE OF
INST. CODE



END OF OUTPUT
PROCEDURE

(d) PROGRAM LISTING - RAARP08

```
*// JOB JNM=RAARP08,CLASS=A,USER=OPSO4000
// LIBDEF CL,TD=USRCL2
// OPTION CATAL
  PHASE RAARP08,*
// EXEC FCOBJL,SIZE=64K
CBL NJSEQ,CLIST,SXREF,FLOW=30,STATE
  IDENTIFICATION DIVISION.
    PROGRAM-ID. RAARP08.
    AUTHOR. CKC, AWK, AMK, NKM.
    ENVIRONMENT DIVISION.
    CONFIGURATION SECTION.
      SOURCE-COMPUTER. IBM-370.
      OBJECT-COMPUTER. IBM-370.
      SPECIAL-NAMES. CO1 IS NEWPAGE
                     SYSIPT IS CREADER.
    INPUT-OUTPUT SECTION.
    FILE-CONTROL.
      SELECT DATAFILE ASSIGN TO SYS002-DA-3340-S.
      SELECT EQUIP-FL ASSIGN TO SYS003-UT-3420-S.
      SELECT SORT-FL ASSIGN TO SYS001-DA-3340-S-SORTWK1.
      SELECT INST-FILE ASSIGN TO SYS025-JR-2501-S.
      SELECT PRINT-FL ASSIGN TO SYS027-JR-1403-S.
    DATA DIVISION.
    FILE SECTION.
      FD DATAFILE RECORDING MODE IS F
        BLOCK CONTAINS 7000 CHARACTERS
        LABEL RECORDS ARE STANDARD
        DATA RECORD IS INREC.
      * VALUE OF ID IS 'RAARDATA'.
      01 INREC.
        02 FILLER PIC X(140).
      FD INST-FILE RECORDING MODE IS F
        LABEL RECORDS ARE OMITTED
        DATA RECORDS IS INST-REC.
      * VALUE OF ID IS 'RAARINST'.
      01 INST-REC.
        02 INST-CODE PIC 9(03).
        02 FILLER PIC X.
        02 INST-NAME PIC X(63).
        02 FILLER PIC X(13).
      *
      FD EQUIP-FL RECORDING MODE IS F
        BLOCK CONTAINS 8000 CHARACTERS
        LABEL RECORDS ARE STANDARD
        DATA RECORD IS EQUIP-REC.
      * VALUE OF ID IS 'RAAREQUIP-DATA'.
      01 EQUIP-REC.
        02 EQUIP-NO PIC 99.
        02 FILLER PIC X.
        02 EQUIP-NAME PIC X(77).
      SD SORT-FL RECORDING MODE IS F
        LABEL RECORDS ARE STANDARD.
      01 SORTREC.
        02 S-KEY.
          03 S-INST-CODE PIC X(03).
          03 S-EQUIP-CODE PIC X(02).
          03 S-COJD PIC X.
        02 S-QTY PIC X(02).
        02 S-QTY1 REDEFINES S-QTY PIC 99.
      FD PRINT-FL RECORDING MODE IS F
        LABEL RECORDS ARE OMITTED
        DATA RECORDS IS LP-REC.
      01 LP-REC.
        02 FILLER PIC X(133).
```

WORKING-STORAGE SECTION.

```

77 SW1          PIC 9 VALUE 0.
77 LCT          PIC 999 VALUE 0.
77 PAGECT      PIC 999 VALUE 0.
77 CTR1        PIC 999 VALUE 0.
77 CTR2        PIC 999 VALUE 0.
77 CTR3        PIC 999 VALUE 0.
01 PARA-CARD.
  02 P-DATE     PIC X(07).
  02 FILLER     PIC X(73).
01 INST-CODE-S.
  02 ID-CODE-S  PIC X(03).
  02 ID-NO-S REDEFINES ID-CODE-S PIC 999.
01 INST-TABLE.
  02 TINST-CODE      PIC X(03) OCCURS 150.
  02 TINST-NM       PIC X(63) OCCURS 150.
  02 TMODE-1        PIC X(03) OCCURS 999.
01 EQUP-TABLE.
  02 TEQUP-CODE     PIC X(02) OCCURS 99.
  02 TEQUP-NAME     PIC X(60) OCCURS 99.
  02 TMODE-2        PIC XX OCCURS 999.
01 FILLER.
  02 WEQUP-CODE     PIC XX.
  02 WQTY           PIC XX.
  02 WQTY1 REDEFINES WQTY PIC 99.
  02 WCOND          PIC X.
01 WJRKREC.
  02 RINST-CODE     PIC X(03).
  02 FILLER         PIC X(03).
  02 RREC-TYPE      PIC XX.
  02 RREC-TP REDEFINES RREC-TYPE PIC 99.
  02 REQUP-CODE-1   PIC X(02).
  02 RQTY-1         PIC X(02).
  02 RYR-1          PIC XX.
  02 RCOND-1        PIC X.
  02 RPRCT-1        PIC XXX.
  02 RCOST-1        PIC X(07).
  02 REQUP-CODE-2   PIC XX.
  02 RQTY-2         PIC XX.
  02 RYR-2          PIC XX.
  02 RCOND-2        PIC X.
  02 RPRCT-2        PIC XXX.
  02 RCOST-2        PIC X(07).
01 HEAD1.
  02 FILLER         PIC X(03) VALUE SPACES.
  02 HDATE          PIC X(08).
  02 FILLER         PIC X(14) VALUE SPACES.
  02 FILLER         PIC X(55) VALUE
    'N A T I O N A L C O U N C I L F O R S C I E N C E'.
  02 FILLER         PIC X(30) VALUE
    ' A N D T E C H N O L O G Y'.
  02 FILLER         PIC X(11) VALUE SPACES.
  02 FILLER         PIC X(05) VALUE 'PAGE:'.
  02 H1PAGE         PIC ZZ9.
  02 FILLER         PIC X(04) VALUE SPACES.
*
01 HEAD2.
  02 FILLER         PIC X(45) VALUE SPACES.
  02 FILLER         PIC X(45) VALUE
    'RESOURCE ALLOCATION IN AGRICULTURAL RESEACH '.
  02 FILLER         PIC X(43) VALUE SPACES.
*
01 HEAD3A.
  02 FILLER         PIC X(03) VALUE SPACES.
  02 FILLER         PIC X(07) VALUE 'TABLE: '.
  02 FILLER         PIC XXX VALUE '08A'.

```

```

02 FILLER      PIC X(32)  VALUE SPACES.
02 FILLER      PIC X(48)  VALUE
    'ANALYSIS OF MAJOR SCIENTIFIC EQUIPMENT MAIN DATA'.
02 FILLER      PIC X(20)  VALUE 'FILE RECORD TYPE 12 '.
02 H3AYEAR     PIC X(07).
02 FILLER      PIC X(13)  VALUE SPACES.
01 HEAD3B.
02 FILLER      PIC XXX VALUE SPACES.
02 FILLER      PIC X(07)  VALUE 'TABLE: '.
02 FILLER      PIC X(03)  VALUE '088'.
02 FILLER      PIC X(32)  VALUE SPACES.
02 FILLER      PIC X(53)  VALUE
    'LOCATION AND CONDITION OF MAJOR SCIENTIFIC EQUIPMENT '.
02 H3BYEAR     PIC X(07)  VALUE SPACES.
02 FILLER      PIC X(28)  VALUE SPACES.
01 HEAD4.
02 FILLER      PIC X(45)  VALUE SPACES.
02 FILLER      PIC X(60)  VALUE ALL '-'.
02 FILLER      PIC X(28)  VALUE SPACES.
*
*
01 HEAD5.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(26)  VALUE
    'INSTITUTION CODE & NAME :-'.
02 FILLER      PIC X(02)  VALUE SPACES.
02 H6INST-CODE PIC XXX.
02 FILLER      PIC XX    VALUE SPACES.
02 H6INST-VM   PIC X(63).
02 FILLER      PIC X(17)  VALUE SPACES.
*
01 HEAD6.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(25)  VALUE
    'E Q U I P M E N T'.
02 FILLER      PIC X(48)  VALUE SPACES.
02 FILLER      PIC X(08)  VALUE 'QUANTITY'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(09)  VALUE 'CONDITION'.
02 FILLER      PIC X(18)  VALUE SPACES.
01 HEAD7.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(29)  VALUE
    'CODE D E S C R I P T I O N'.
02 FILLER      PIC X(84)  VALUE SPACES.
*
01 HEAD8.
02 FILLER      PIC X(20)  VALUE SPACES.
02 FILLER      PIC X(04)  VALUE ALL '-'.
02 FILLER      PIC X(04)  VALUE SPACES.
02 FILLER      PIC X(21)  VALUE ALL '-'.
02 FILLER      PIC X(44)  VALUE SPACES.
02 FILLER      PIC X(08)  VALUE ALL '-'.
02 FILLER      PIC X(05)  VALUE SPACES.
02 FILLER      PIC X(09)  VALUE ALL '-'.
02 FILLER      PIC X(18)  VALUE SPACES.
01 LINE1.
02 FILLER      PIC X(21).
02 LI-CODE     PIC X(02).
02 FILLER      PIC X(05).
02 LIENAME     PIC X(60).
02 FILLER      PIC X(09).
02 LI-QTY      PIC Z9.
02 FILLER      PIC X(07).
02 LI-COND     PIC X(15).
02 FILLER      PIC X(12).

```

```

*
01 CONDITION-TABLE.
    02 FILLER      PIC X(17)  VALUE
        '1 EXCELLENT      '.
    02 FILLER      PIC X(17)  VALUE
        '2 GOOD           '.
    02 FILLER      PIC X(17)  VALUE
        '3 FAIR           '.
    02 FILLER      PIC X(17)  VALUE
        '4 POOR           '.
    02 FILLER      PIC X(17)  VALUE
        '5 NOT OPERATIONAL'.
01 FILLER REDEFINES CONDITION-TABLE.
    02 FILLER OCCURS 5.
        03 TCND-CODE      PIC X.
        03 FILLER        PIC X.
        03 TCND-NAME      PIC X(15).
PROCEDURE DIVISION.
P-START.
    OPEN INPUT DATAFILE  EQUIP-FL
        INST-FILE
    OUTPUT      PRINT-FL.
    MOVE SPACES  TO  INST-TABLE  EQUIP-TABLE
        LINE1.
    MOVE 1 TO CTR2 CTR3.
    MOVE CURRENT-DATE TO HDATE.
    ACCEPT PARA-CARD FROM CREADER.
    IF P-DATE = SPACES
        DISPLAY 'PARAMETER ERROR'
        DISPLAY 'RUN ABANDONED'
        STOP RUN.
    MOVE P-DATE TO H3AYEAR H3BYEAR.
    SORT SORT-FL ON ASCENDING KEY  S-KEY
        INPJT PROCEDURE IS P-INPUT
        OUTPUT PROCEDURE IS P-OUTPUT.
P-INPUT SECTION.
P-READ-1.
    READ EQUIP-FL AT END GO TO P-READ-2.
    IF CTR3 > 99 GO TO P-TABLE-OVERFLOW.
    MOVE EQUIP-NO TO TEQUIP-CODE (CTR3).
    MOVE EQUIP-NAME TO TEQUIP-NAME (CTR3).
    MOVE CTR3 TO TMODE-2 (EQUIP-NO).
    ADD 1 TO CTR3.
    GO TO P-READ-1.
P-TABLE-OVERFLOW.
    DISPLAY 'EQUIPMENT TABLE FULL'.
    DISPLAY 'RUN ABANDONED'.
    STOP RUN.
*
P-READ-2.
    READ INST-FILE AT END GO TO P-READ-3.
    IF CTR2 > 150 GO TO P-TABLE-FULL.
    MOVE INST-CODE TO TINST-CODE (CTR2).
    MOVE INST-NAME TO TINST-NAME (CTR2).
    MOVE CTR2 TO TMODE-1 (INST-CODE).
    ADD 1 TO CTR2.
    GO TO P-READ-2.
*
P-TABLE-FULL.
    DISPLAY 'INSTITUTION TABLE FULL'.
    DISPLAY 'RUN ABANDONED'.
    STOP RUN.
*
P-READ-3.
    READ DATAFILE INTO WORKREC AT END GO TO P-END.
    IF RREC-TYPE NOT = '12' GO TO P-READ-3.

```

```

P-K1.
  IF SW1 = 1 GO TO P-CMPARE.
  MOVE 1 TO SW1.
P-STORE.
  MOVE RINST-CODE TO ID-CODE-S.
P-CMPARE.
  IF RINST-CODE NOT = ID-CODE-S GO TO P-INST-CHGE.
  IF REQUP-CODE-1 NOT NUMERIC OR
    REQUP-CODE-1 = SPACES GO TO P-CHECK-2.
  MOVE RINST-CODE TO S-INST-CODE.
  MOVE REQUP-CODE-1 TO WEQUP-CODE S-EQUP-CODE.
  MOVE RQTY-1 TO WQTY S-QTY.
  MOVE RCOND-1 TO WCOND S-COND.
  RELEASE SORTREC.
  PERFORM P-PRINT THRU P-PRINT-EXIT.
P-CHECK-2.
  IF REQUP-CODE-2 NOT NUMERIC OR
    REQUP-CODE-2 = SPACES GO TO P-READ-3.
  MOVE RINST-CODE TO S-INST-CODE.
  MOVE REQUP-CODE-2 TO WEQUP-CODE S-EQUP-CODE.
  MOVE RQTY-2 TO WQTY S-QTY.
  MOVE RCOND-2 TO WCOND S-COND.
  RELEASE SORTREC.
  PERFORM P-PRINT THRU P-PRINT-EXIT.
  GO TO P-READ-3.
*
*
P-INST-CHGE.
  MOVE 0 TO LCT.
  MOVE SPACES TO LINE1.
  GO TO P-STORE.
*
P-PRINT.
  PERFORM P-HEAD THRU P-HEAD-EXIT.
  MOVE WEQUP-CODE TO L1-CODE.
  PERFORM P-EQUP-DES THRU P-EQUP-EXIT.
  MOVE WQTY TO L1-QTY.
  PERFORM P-COND-DESC THRU P-COND-EXIT.
  WRITE LP-REC FROM LINE1 AFTER 2.
  SUBTRACT 2 FROM LCT.
  MOVE SPACES TO LINE1.
P-PRINT-EXIT.
  EXIT.
P-EQUP-DES.
  MOVE 1 TO CTR1.
  MOVE SPACES TO LIENAME.
P-EQUP-S.
  IF CTR1 > 99 MOVE 0 TO CTR1 GO TO P-EQUP-EXIT.
  IF TEQUP-CODE (CTR1) = WEQUP-CODE
    MOVE TEQUP-NAME (CTR1) TO LIENAME
    GO TO P-EQUP-EXIT.
  ADD 1 TO CTR1.
  GO TO P-EQUP-S.
P-EQUP-EXIT.
  EXIT.
*
P-COND-DESC.
  MOVE 1 TO CTR2.
  MOVE SPACES TO L1-COND.
P-COND-S.
  IF CTR2 > 5 MOVE 0 TO CTR2 GO TO P-COND-EXIT.
  IF TCOND-CODE (CTR2) = WCOND
    MOVE TCOND-NAME (CTR2) TO L1-COND GO TO P-COND-EXIT.
  ADD 1 TO CTR2 GO TO P-COND-S.
P-COND-EXIT.
  EXIT.

```

```

P-HEAD.
  IF LCT > 0 GO TO P-HEAD-EXIT.
  ADD 1 TO PAGECT.
  MOVE PAGECT TO H1PAGE.
  WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
  WRITE LP-REC FROM HEAD2 AFTER 1.
  WRITE LP-REC FROM HEAD3A AFTER 2.
  WRITE LP-REC FROM HEAD4 AFTER 1.
  MOVE ID-NO-S TO H6INST-CJDE.
  IF TMODE-1 (ID-NO-S) = SPACES
  MOVE SPACES TO H6INST-NM GO TO P-HD.
  MOVE TMODE-1 (ID-NO-S) TO CTR2.
  MOVE TINST-NM (CTR2) TO H5INST-NM.
P-HD.
  WRITE LP-REC FROM HEAD5 AFTER 2.
  WRITE LP-REC FROM HEAD6 AFTER 2.
  WRITE LP-REC FROM HEAD7 AFTER 2.
  WRITE LP-REC FROM HEAD8 AFTER 1.
  MOVE 40 TO LCT.
P-HEAD-EXIT.
  EXIT.
*
P-END.
  CLOSE DATAFILE.
  MOVE SPACES TO LP-REC.
  WRITE LP-REC AFTER NEWPAGE.
  WRITE LP-REC AFTER NEWPAGE.
P-OUTPUT SECTION.
P-RETURN.
  MOVE 0 TO PAGECT LCT SW1 WQTY1.
  MOVE SPACES TO LINE1.
  MOVE 1 TO CTR2 CTR3.
*
P-READ-4.
  RETURN SORT-FL RECORD AT END GO TO P-END-2.
P-R2.
  IF SW1 = 1 GO TO P-COMPARE-2.
  MOVE 1 TO SW1.
P-STORE-2.
  MOVE S-INST-CODE TO ID-CJDE-S.
P-STORE-3.
  MOVE S-EQUP-CODE TO WEQUP-CODE.
  MOVE S-COND TO WCOND.
P-COMPARE-2.
  IF S-INST-CODE NOT = ID-CJDE-S GO TO P-INST-CHG-2.
  IF S-EQUP-CODE NOT NUMERIC OR
    S-EQUP-CODE = SPACES GO TO P-READ-4.
  EXAMINE S-QTY REPLACING LEADING SPACES BY ZERJS.
  IF S-QTY NOT NUMERIC GO TO P-READ-4.
  IF S-EQUP-CODE NOT = WEQUP-CODE GO TO P-CHANGE-2.
  IF S-COND = WCOND ADD S-QTY1 TO WQTY1
    GO TO P-READ-4.
P-CHANGE-2.
  PERFORM P-PRINT-2 THRU P-PRINT-2-EXIT.
  MOVE 0 TO WQTY1.
  GO TO P-STORE-3.
*
P-INST-CHG-2.
  PERFORM P-PRINT-2 THRU P-PRINT-2-EXIT.
  MOVE 0 TO LCT WQTY1.
  MOVE SPACES TO LINE1.
  GO TO P-STORE-2.
*
P-PRINT-2.
  IF WEQUP-CODE < '01' OR
    WEQUP-CODE > '44' GO TO P-PRINT-2-EXIT.

```

```

PERFORM P-HEAD-2 THRU P-HEAD-2-EXIT.
MOVE WEQUP-CODE TO L1-CODE.
PERFORM P-EQUP-DES-2 THRU P-EQUP-2-EXIT.
MOVE WQTY TO L1-QTY.
PERFORM P-COND-DESC-2 THRU P-COND-2-EXIT.
WRITE LP-REC FROM LINE1 AFTER 2.
SUBTRACT 2 FROM LCT.
MOVE SPACES TO LINE1.
P-PRINT-2-EXIT.
EXIT.
P-EQUP-DES-2.
MOVE 1 TO CTR1.
MOVE SPACES TO LIENAME.
P-EQUP-S-2.
IF CTR1 > 99 MOVE 0 TO CTR1 GO TO P-EQUP-2-EXIT.
IF TEQUP-CODE (CTR1) = WEQUP-CODE
    MOVE TEQUP-NAME (CTR1) TO LIENAME
    GO TO P-EQUP-2-EXIT.
ADD 1 TO CTR1.
GO TO P-EQUP-S-2.
P-EQUP-2-EXIT.
EXIT.
*
P-COND-DESC-2.
MOVE 1 TO CTR2.
MOVE SPACES TO L1-COND.
P-COND-S-2.
IF CTR2 > 5 MOVE 0 TO CTR2 GO TO P-COND-2-EXIT.
IF TCOND-CODE (CTR2) = WCOND
    MOVE TCOND-NAME (CTR2) TO L1-COND GO TO P-COND-2-EXIT.
ADD 1 TO CTR2 GO TO P-COND-S-2.
P-COND-2-EXIT.
EXIT.
P-HEAD-2.
IF LCT > 0 GO TO P-HEAD-2-EXIT.
ADD 1 TO PAGECT.
MOVE PAGECT TO H1PAGE.
WRITE LP-REC FROM HEAD1 AFTER NEWPAGE.
WRITE LP-REC FROM HEAD2 AFTER 1.
WRITE LP-REC FROM HEAD3B AFTER 2.
WRITE LP-REC FROM HEAD4 AFTER 1.
MOVE ID-NO-S TO H6INST-CODE.
IF TMODE-1 (ID-NO-S) = SPACES
    MOVE SPACES TO H6INST-NM GO TO P-HD-2.
MOVE TMODE-1 (ID-NO-S) TO CTR2.
MOVE TINST-NM (CTR2) TO H6INST-NM.
P-HD-2.
WRITE LP-REC FROM HEAD5 AFTER 2.
WRITE LP-REC FROM HEAD6 AFTER 2.
WRITE LP-REC FROM HEAD7 AFTER 2.
WRITE LP-REC FROM HEAD8 AFTER 1.
MOVE 40 TO LCT.
P-HEAD-2-EXIT.
EXIT.
*
P-END-2.
CLOSE INST-FILE EQUP-FL
PRINT-FL.
STOP RUN.
/*
// LBLTYP TAPE
// EXEC LNKEDT
/*
* E& EOJ

```

CHAPTER IV

OPERATING PROCEDURES

(A) GENERAL LISTINGS

(i) JOB RAART80

4.1 This job produces an error LIST 80 of the main data file for manual corrections and resubmission. At the same time it produces a magnetic tape file of the accepted data labelled RAARDATA.

(a) Operating Instructions

4.2 The operator is instructed to enter the following message through the console: S RDR, OOA, A, 'RAARINPT'; N where N is the number of diskettes to be read. RAARWPT is used as a common header in all the diskettes with a 'C' in column 45 of all the diskettes except the last one which bears an 'L' in column 45. The required JCL statements are listed in the following pages.

(b) RAART 80 J.C.L.' STATEMENTS

```
4.3 * $J JJB JVM=RAART80,CLASS=A,USER=JPSQ4000
// JJB RAART80
// LIBDEF CL,SEARCH=JSRCL2
// ASSIGN SYS001,X'00B'
// ASSIGN SYS002,X'280'
// TLBL SYS002,'RAARDATA',999
// DLBL SYS001,'RAARINPT'
// EXTENT SYS001
// EXTENT SYS001
// EXTENT SYS001
// EXTENT SYS001
// EXTENT SYS001
// PAUSE LOAD INPUT DISKETTES ON 00B & SCRATCH TAPE ON 280
// EXEC RAARP80
/*
/8
* $J EDJ
```

(ii) JOB RAART81

- 4.4 This job, which produces a listing (LIST 81) of the sorted RAARDATA file, is run in two steps.

Job Step 1

The input RAARDATA is sorted by institution code, Batch number and Record type. An output tape file labelled RAARDATA-ST01 is created.

Job Step 2

The output tape file from job Step 1 is then read by program RAARP81, together with the institution file on diskette assigned as a card file. The Output from this job step is a printout of the main data file entitled LIST 81.

(a) Operating Instructions

- 4.5 The following message is typed on the console before reading the diskettes in the order given: SRDR, OOA, A, 'RAARINST', N where N is the number of diskettes to be read and RAARINST is a common header in all the diskettes with a 'C' in column 45 of the first diskettes and an 'L' in column 45 of the last diskette. The required JCL statements are listed in the following pages.

(b) RAART81 J.C.L. STATEMENTS

```
4.6 * ** JOB JNM=RAART81,CLASS=A,USER=DPS04000
// JOB RAART81
// LIBDEF CL,SEARCH=USRCL2
* ** PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'280'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA1A'
// TLBL SORTOUT,'RAARDA1A-ST01',999
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,3,CH,A,131,3,CH,A,7,2,CH,A),WORK=1,FILES=1
  RECDRD TYPE=F,LENGTH=140
  INPFIL BLKSIZE=7000
  OUTFIL BLKSIZE=7000
END
/*
* STEP 2 PRINTING OF RAART81 TABLE
// ASSGN SYS001,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA1A-ST01'
// PAUSE REWIND THE SCRATCH TAPE ON 282
// EXEC RAARP81
```

(iii) JOB RAART82

4.7 This job produces a validation error LIST82 and also a clean master file from the raw data file.

(a) Operating Instructions

4.8 The operator is instructed to enter the following message on the console:

SRDR, OOA, A, 'RAARPROG', N where N is the number of diskettes to be read, RAARPROG is a common header in column 45 of all except the last diskette which bears an 'L' in column 45. The required JCL statements are listed in the following pages.

(b) RAART82 J.C.L. STATEMENTS

```
4.9 * $J JOB JNM=RAART82,CLASS=A,USER=DPS04000
// JOB RAART82
// LIBDEF CL,SEARCH=USRCL2
* $J PRT COPY=1
// ASSGN SYS001,X'280'
// ASSGN SYS002,X'283'
// ASSGN SYS003,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDATA'
// TLBL SYS002,'RAARDATA',365
// TLBL SYS003,'RAARPROJ-DATA-S'
// PAUSE LOAD INPUT TAPES ON 280,282 & SCRATCH TAPE ON 283
// EXEC RAARP82
```

(iv) JOB RAART83

4.10 This job produces validation error LIST83 from the amendment records submitted on diskette. In addition a transaction file on tape of all the valid records.

(a) Operating Instructions

4.11 The following message is typed on the Operator Console before reading the diskettes in the order given:

SRDR, OOA, A, 'RAARPROG', N where N is the number of diskettes to be read, RAARPROG is a Common header in all the diskettes with a 'C' in Column 45 in all except the last diskette which should have an 'L'. The data diskette is read when required by the pause card. The required JCL statements are listed in the following pages.

(b) RAART83 J.C.L. STATEMENTS

```
4.12* 88 JJB JNM=RAART83,CLASS=A,USER=DPS04000
// JJB RAART83
// LIBDEF CL,SEARCH=USRCL2
* 88 PRT COPY=1
// ASSGN SYS001,X'003'
// ASSGN SYS002,X'282'
// ASSGN SYS003,X'283'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// DLBL SYS001,'RAARINPT'
// EXTENT SYS001
// TLBL SYS002,'RAARTRAN',365
// TLBL SYS003,'RAARPROJ-DATA-S'
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH ON 282
// PAUSE LOAD INPUT DISKETTE ON 00B
// EXEC RAARP83
```

(v) JOB RAART84

- 4.13 This job which produces an update report (LIST84) and an updated master file is run in two job steps:

Job Step 1

The input RAARTRAN file is sorted by institution code, record type, item code, project number and programme number. An output disc file, labelled RAARTRAN-S is created.

Job Step 2

The output disc file from job step 1 is then assigned to be read by the program RAARP84, together with the brought forward master file. The output report and an updated master file labelled RAARDATA

(a) Operating Instructions

- 4.14 The operator is instructed to start the diskette Reader and then read the JCL's from diskette. The required JCL statements follow in the next page.

(b) RAART84 JCL STATEMENTS

```
4.15 * ## JJB JNM=RAART84,CLASS=A,USER=DPS04000
// JJB RAART84
// LIBDEF CL,SEARCH=JSRCL2
* ## PRT COPY=1
// ASSGN SYS001,DISK,VOL=CPWACC,SHR
// ASSGN SYS002,X'28D'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// DLBL SORTOUT,'RAARTRAN-S',0
// EXTENT SYS001,CPWACC,1,0,2208,120
// TLBL SORTINI,'RAARTRAN'
// DLBL SORTWK1,0
// EXTENT SYS003,CPWACC,1,0,2328,120
// PAUSE LOAD INPUT TAPE ON 28D
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,5,CH,A,7,2,CH,A,99,30,CH,A,9,3,CH,A),WORK=1,FILES=1
  RECDR TYPE=F,LENGTH=128
  INPFIL BLKSIZE=6400
  OUTFIL BLKSIZE=6400
  END
/*
* STEP 2 UPDATE BEGINS
// ASSGN SYS001,DISK,VOL=CPWACC,SHR
// ASSGN SYS002,X'282'
// ASSGN SYS003,X'284'
// ASSGN SYS027,PRINTER
// DLBL SYS001,'RAARTRAN-S',0
// EXTENT SYS001,CPWACC,1,0,2208,120
// TLBL SYS002,'RAARDA'
// TLBL SYS003,'RAARDA',365
// PAUSE LOAD INPUT TAPE ON 282 & SCRATCH TAPE ON 284
// EXEC RAARP84
/*
/8
* ## EJJ
```

(B) DICTIONARY FILE LISTINGS

(i) JOB RAART90

- 4.16 This job produces unsorted listings (LIST 90A and LIST 90B) of either (a) the project dictionary file or (b) the programme dictionary file from diskettes depending on a parameter card; and also a sorted magnetic file. The job is run in two job steps.

Job Step 1:

In this job step, the program reads a parameter card and either of the project dictionary and programme dictionary file data on diskettes. It produces a listing of the file and also creates a disc file labelled either RAARPROJ-DATA or RAARPROG-DATA respectively.

Job Step 2

The disc file created in job step 1 is sorted in ascending sequence of either project number or program number to produce a sorted file on tape, labelled either RAARPROJ-ST02 or RAARPROG-ST03 respectively.

(a) Operating Instructions

- 4.17 SRDR, OOA, A, 'RAARPROJ', N or SRDR, OOA, A, 'RAARPROG', N is the message to be typed by the operator before reading the diskettes, where N is the number of input diskettes to be read and RAARPROJ or RAARPROG is a common header in all the diskettes of the particular job suit with a 'C' in column 45 of the first diskettes and an 'L' in column 45 of the last diskette. The necessary JCL statements and parameter formats follow in the next pages.

(b) RAART90 JCL STATEMENTS

```
4.18* ## JOB JVM=RAART90,CLASS=A,USER=DPS04000
// JOB RAART90
// LIBDEF CL,SEARCH=JSRCL2
* ## PRT COPY=1
// ASSGN SYS001,DISK,VOL=CPWACC,SHR
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// DLBL SYS001,'RAARPRDG-DATA',0
// EXTENT SYS001,CPWACC,1,0,2208,72
// EXEC RAARP90
2 PROGRAMME DICTIONARY FILE LISTING (UNSORTED)
```

```
/*
* STEP 2 SORTING THE DATA
// ASSGN SYS001,X'282' OUTPUT
// ASSGN SYS002,DISK,VOL=CPWACC,SHR
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTOUT,'RAARPROG-ST03',999
// DLBL SORTIN1,'RAARPROG-DATA',0
// EXTENT SYS002,CPWACC,1,0,2208,72
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2280,168
// PAUSE LOAD SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,15,CH,A),WORK=1,FILES=1
  RECDJ TYPE=F,LENGTH=080
  INPFIL BLKSIZE=8000
  OUTFIL BLKSIZE=8000
END
/*
/ &
* ## ECU
```

(c) RAART90 PARAMETER FORMAT

4.19 <u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
1.	PARAMETER NUMBER	1	9 (e.g. 1 for PROJECT, 2 for PROGRAMME)
2.	HEADING (PROJECT/PROGRAMME)	2-61	x(60)
3.	FILLER	62-80	x(19)

(ii) JOB RAART91

4.20 This job produces listings (LIST 91A and LIST 91B) of either the sorted RAARPROJ-ST02 or RAARPROG-ST03 file, depending on a parameter card

(a) Operating Instructions

4.21 A parameter card giving information on the files to be used and the listings to be produced is read. Then the appropriate input file is assigned to a tape drive and the corresponding listing produced. The necessary JCL statements and parameter formats follow in the next pages.

(b) RAART91 JCL STATEMENTS

```
4.22: * ## JOB JVM=RAART91,CLASS=A,USER=OPS04000
      // JOB RAART91
      // LIBDEF CL,SEARCH=JSRCL2
      * ## PRT COPY=1
      // ASSGN SYS001,X'285'
      // ASSGN SYS027,PRINTER
      // TLBL SYS001,'RAARPRJJ-ST02'
      // PAUSE LOAD INPUT TAPE ON 285
      // EXEC RAARP91
      IPROJECT DICTIONARY FILE LISTING (SORTED)
      /*
      /&
      * ## END
```

(c) RAART91 PARAMETER FORMAT

4.23	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1.	PARAMETER NUMBER	1	9 (e.g. 1 for PROJEC 2 for PROGRAMME)
	2.	HEADING (PROJECT/PROGRAMME)	2-61	x(60)
	3.	FILLER	62-80	x(19)

(iii) JOB RAART92

4.24 Depending on the parameter card supplied, this job produces various listings of dictionary files as follows:-

- (a) LIST 92A Institution Dictionary file listing
- (b) LIST 92B Subject area Dictionary file listing
- (c) LIST 92C Major scientific equipment Dictionary file listing
- (d) LIST 92D Fields of research Dictionary file listing

(a) Operating Instructions

4.25 A parameter card is read to give information on the type of input dictionary file to be processed and the listings to be produced. Four dictionary files maintained on diskette are then processed and four types of listings produced from these files. The necessary JCL statements and parameter formats follow in the next pages.

(b) RAART 92 JCL STATEMENTS

```
4.26* ## JOB JNM=RAART92,CLASS=A,USER=OPSO4000
// JOB RAART92
// LIBDEF CL,SEARCH=JSRCL2
* ## PRT COPY=1
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// EXEC RAARP92
1  INSTITUTION DICTIONARY FILE LISTING
```

(c) RAART92 PARAMETER FORMAT

4.27	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1.	PARAMETER NUMBER	1	9 (e.g. 1 for INST 2 for SUBJ. 3 for FIELDS 4 for EQUIP)
	2	HEADINGS (DICTIONARY FILES)	2-61	x(60)
	3.	FILLER	62-80	x(19)

(C) MAIN TABULATIONS

(i) JOB RAARTØ1A, RAARTØ1B, RAARTØ2, RAARTØ3, RAARTØ5A, RAARTØ5B, RAARTØ6

4.28 These jobs produce Tables 01A, 01B, Ø2, Ø3, Ø5A, Ø5B and Ø6 respectively and are run in two job steps.

Job Step 1

This job step contains a set of JCLS for the sort program; which subsequently sorts the input RAARDATA File and produces an output tape file labelled RAARDATA-STnn, where nn is the sort number. The sort keys are then Institution Code and Record Type.

Job Step 2

In this job step, the output tape from Job Step 1 is rewound and is then read by the appropriate program. Also assigned to the program is the institution dictionary file on diskette(s) which is read as a card file.

(a) Operating Instructions

4.29 The operator is instructed to type the following message on the Console:SRDR, OOA, A, 'RAARINST', N, where N is the number of diskettes to be read, RAARINST is the common header in all the diskette with a 'C' in column 45 of every diskette(s) and an 'L' in column 45 of the last diskette. The diskettes are then read in the order given where the first diskette must contain the starting JCLS and the last diskette must contain the terminating JCL. The necessary JCL statements and parameter formats follow in the next pages.

b) RAART01A JCL STATEMENTS

```

4.30 * ## JJB JNM=RAART01A,CLASS=A,USER=OPSD4000
// JJB RAART01A          TABLE 01A
// LIBDEF CL,SEARCH=PRDCLC
* ## PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'280'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA1A'
// TLBL SORTOUT,'RAARDA1A-ST04',999
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,3,CH,A,7,2,CH,A),WORK=1,FILES=1
  RECORD TYPE=F,LENGTH=140
  INPFIL BLKSIZE=7000
  OUTFIL BLKSIZE=7000
  INCLUDE COND=(1,2,CH,EQ,C'01',1,7,2,CH,EQ,C'02')
END
/*
* STEP 2 PRINTING OF TABLE 01A
// ASSGN SYS001,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA1A-ST04'
// PAUSE REWIND THE SCRATCH TAPE ON 282
// EXEC RAARPO1A
19701979/80

```

C) RAARTØ1A PARAMETER FORMAT

4.31	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	COMMENCEMENT YEAR	1 - 4	9(04) (e.g. 1970)
	2	LATEST YEAR	5 - 11	X(07) (e.g. 1979/80)
	3	FILLER	12 - 80	X(69)

d) RAART01B JCL STATEMENTS

```

4.32 * ## JOB JNM=RAART01B,CLASS=A,USER=OPS04000
// JOB RAART01B          TABLE 01B
// LIBDEF CL,SEARCH=PRCLC
* ## PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'280'
// ASSGN SYS003,DISK,VJL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA'
// TLBL SORTOUT,'RAARDA-ST05',999
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,3,CH,A,7,2,CH,A),WORK=1,FILES=1
  RECORD TYPE=F,LENGTH=140
  INPFIL BLKSIZE=7000
  OUTFIL BLKSIZE=7000
  INCLUDE COND=(7,2,CH,EQ,C'01',1,7,2,CH,EQ,C'02')
END
/*
* STEP 2 PRINTING OF TABLE 01B
// ASSGN SYS001,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-ST05'
// PAUSE REWIND THE SCRATCH TAPE ON 282
// EXEC RAARPO1B
1979/80

```

e) RAARTØ1B PARAMETER FORMAT

4.33	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	LATEST YEAR COVERED BY SURVEY	1 - 7	X(07) (e.g. 1979/80)
	2	FILLER	8 - 80	X(73)

f) RAART02 JCL STATEMENTS

```

4.34 * ** JCB JNM=RAART02,CLASS=A,USER=OPS04000
// JCB RAART02          TABLE 02
// LIBDEF CL,SEARCH=JSRCL2
* ** PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'280'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA'
// TLBL SORTOUT,'RAARDA-ST06',999
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
    SORT FIELDS=(1,3,CH,A,7,2,CH,A),WORK=1,FILES=1
    RECD TYPE=F,LENGTH=140
    INPFIL BLKSIZE=7000
    OUTFIL BLKSIZE=7000
    INCLUDE COND=(7,2,CH,EQ,C'03',1,7,2,CH,EQ,C'05')
END
/*
* STEP 2 PRINTING OF TABLE 02
// ASSGN SYS001,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-ST06'
// PAUSE REWIND THE SCRATCH TAPE ON 282
// EXEC RAARPO2
1970

```


g) RAARTØ2 PARAMETER FORMAT

4.35	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	COMMENCEMENT YEAR	1 - 4	9(04) (e.g. 1970)
	2	FILLER	5 - 80	X(76)

h) RAART03 JCL STATEMENTS

```

4.36 * ## JOB JNM=RAART03,CLASS=A,USER=OP504000
// JOB RAART03
// LIBDEF CL,SEARCH=USRCL2
* ## PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'283'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA'
// TLBL SORTOUT,'RAARDA-ST07',999
// DLBL SORTWK1,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH TAPE ON 282
// EXEC SORT
  SORT FIELDS=(1,3,CH,A,7,2,CH,A),WORK=1,FILES=1
  RECDJ TYPE=F,LENGTH=140
  INPFIL BLKSIZE=7000
  OUTFIL BLKSIZE=7000
  END
/*
* STEP 2 PRINTING OF TABLE 03
// ASSGN SYS001,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-ST07'
// PAUSE REWIND THE SCRATCH TAPE ON 282
// EXEC RAARPO3
31ST DEC 1980

```

i) RAART03 PARAMETER FORMAT

4.37	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	LATEST DATE COVERED BY SURVEY	1 - 15	X(15) (e.g. AS AT 31st DEC. 1980)
	2	FILLER	16 - 80	X(65)

j) RAART05A JCL STATEMENTS

```

4,38 * ## JOB JNM=RAART05A,CLASS=A,USER=DPS04000
// JOB RAART05A
// LIBDEF CL,SEARCH=JSRCL2
* ## PRT COPY=1
// ASSIGN SYS001,X'282' OUTPUT
// ASSIGN SYS002,X'280' INPUT
// ASSIGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTOUT,'RAARDA-STA-10',999
// TLBL SORTINI,'RAARDA'
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT ON 280, SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,3,CH,A,7,5,CH,A),WORK=1,FILES=1
  RECDR TYPE=F,LENGTH=140
  INPFIL BLKSIZE=7000
  OUTFIL BLKSIZE=7000
  END
/*
* STEP 2 PRINTS GOVT-TABLE 5A ****
// ASSIGN SYS001,X'282' OUTPUT FROM SORT
// ASSIGN SYS025,READER
// ASSIGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-STA-10'
// PAUSE LOAD OUTPUT FROM SORT ON 282
// EXEC RAARPO5
11979/80 GOVERNMENT INSTITUTIONS POOLED

```

```
4.39 * ## JCB JNM=RAART05B,CLASS=A,USER=OPS04000
// JCB RAART05B
// LIBDEF CL,SEARCH=JSRCL2
* ## PRT COPY=1
// ASSGN SYS001,X'282' OUTPUT
// ASSGN SYS002,X'280' INPUT
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTJUT,'RAARDA-STA10',999
// TLBL SORTINI,'RAARDA'
// DLBL SORTWK1,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT ON 280, SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
  SORT FIELDS=(1,3,CH,A,7,5,CH,A),WORK=1,FILES=1
  RECDJ TYPE=F,LENGTH=140
  INPFIL BLKSIZE=7000
  OUTFIL BLKSIZE=7000
END
/*
* STEP 2 PRINTS GOVT-TABLE 5A ****
// ASSGN SYS001,X'282' OUTPUT FROM SORT
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-STA10'
// PAUSE LOAD OUTPUT FROM SORT ON 282
// EXEC RAARPO5
21979/80 NON-GOVERNMENT INSTITUTIONS POOLED
```

1) RAARTO5A AND RAARTO5B PARAMETER FORMAT

4.40	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	PARAMETER NUMBER	1	9 (e.g. 1 for GOVT. 2 for OTHER)
	2	LATEST YEAR COVERED BY SURVEY	2 - 8	X(07)(e.g 1979/80
	3	HEADING (GOVT/OTHER)	9 - 48	X(40)
	4	FILLER	49 - 80	X(32)

```

4.41* ## JCB JNM=RAART06,CLASS=A,USER=OPSO4000
// JCB RAART06          TABLE 06
// LIBDEF CL,SEARCH=PROCLC
* ## PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'280'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA'
// TLBL SORTOUT,'RAARDA-ST11',999
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH TAPE ON 282
// EXEC SORT,SIZE=64K
    SORT FIELDS=(116,15,C1,A,7,2,C1,A),WORK=1,FILES=1
    RECDJ TYPE=F,LENGTH=140
    INPFIL BLKSIZE=7000
    OUTFIL BLKSIZE=7000
END
/*
* STEP 2 PRINTING OF TABLE 06
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'285'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-ST11'
// TLBL SYS002,'RAARPRJ-DATA-S'
// PAUSE REWIND THE SCRATCH TAPE ON 282 & LOAD PROJECT FILE ON 28
// EXEC RAARPO6
1979/80

```

n) RAART06 PARAMETER FORMAT

4.42	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1.	LATEST YEAR COVERED BY SURVEY	1 - 7	X(07) (e.g. 1979/80)
	2.	FILLER	8 -80	X(73)

(ii) JOBS RAART04A, RAART04B

- 4.43 These two jobs produce Tables 04A and 04B entitled 'Current Research Support for Various Subject Areas - 1979/80 (Manpower)' and 'Current Research Support for Various Subject Areas - 1979/80 (Funding)' respectively. The jobs are run in two major steps:-

Job Step 1

This contains JCL for sorting the input RAARDATA file in ascending sequence of SUBJECT AREA code and record-type. Output from this job step is a sorted tape file labelled RAARDATA-ST08

Job Step 2

The sorted output tape from Step 1 is rewound and then assigned to a tape unit to be read by the appropriate programs. Also input to the programs is the subject area dictionary file on diskette which is read as a card file.

(a) Operating Instructions

- 4.44 The following message is typed on the console before the diskettes are read in the order given:
- SRDR, OOA, A, 'RAARSUBJ', N, where N is the number of diskettes to be read, RAARSUBJ should be the common header in all the diskettes with a 'C' in Column 45 of every diskette and an 'L' in Column 45 of the last diskette. The necessary JCL statements and parameter formats follow in the next pages.

b) RAART04A JCL STATEMENTS

```

4.45 * ## JOB JNM=RAART04A,CLASS=A,USER=OPS04000
      // JOB RAART04A
      // LIBDEF CL,SEARCH=USRCL2
      * ## PRT COPY=1
      // ASSGN SYS001,X'282'
      // ASSGN SYS002,X'280'
      // ASSGN SYS003,DISK,VOL=CPWACC,SHR
      // TLBL SORTIN1,'RAARDA'
      // TLBL SORTOUT,'RAARDA-ST08',999
      // DLBL SORT#K1,0
      // EXTENT SYS003,CPWACC,1,0,2208,240
      // PAUSE LOAD INPUT TAPE ON 280 & SCRATCH ON 282
      // EXEC SORT,SIZE=54K
      SORT FIELDS=(105,3,CH,A,7,2,CH,A),WORK=1,FILES=1
      RECDRD TYPE=F,LENGTH=140
      INPFIL BLKSIZE=7000
      OUTFIL BLKSIZE=7000
      INCLUDE COND=(7,2,CH,EQ,C'09',1,7,2,CH,EQ,C'10')
      END
      /*
      * STEP 2 PRINTING OF TABLE 04A
      // ASSGN SYS001,X'282'
      // ASSGN SYS025,READER
      // ASSGN SYS027,PRINTER
      // TLBL SYS001,'RAARDA-ST08'
      // PAUSE REWIND SCRATCH TAPE ON 282
      // EXEC RAARPO4A
      1979/80
  
```

c) RAARTO4A PARAMETER FORMAT

4.46	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1.	LATEST YEAR COVERED BY SURVEY	1 - 7	X(07) (e.g. 1979/80)
	2.	FILLER	8 - 80	X(73)

d) RAART04B JCL STATEMENTS

```

4.47 * ## JOB JNM=RAART04B,CLASS=A,JSER=OPSO4000
// JOB RAART04B
// LIBDEF CL,SEARCH=USRCL2
* ## PRT COPY=1
// ASSGN SYS001,X'282'
// ASSGN SYS002,X'280'
// ASSGN SYS003,DISK,VOL=CPWACC,SHR
// TLBL SORTIN1,'RAARDA'
// TLBL SORTOUT,'RAARDA-ST09',999
// DLBL SORTWK1,,0
// EXTENT SYS003,CPWACC,1,0,2208,240
// PAUSE LOAD INPUT TAPE ON 280 & SCRATCH ON 282
// EXEC SORT,SIZE=54K
    SORT FIELDS=(105,3,CH,A,7,2,CH,A),WORK=1,FILES=1
    RECDR TYPE=F,LENGTH=140
    INPFIL BLKSIZE=7000
    OUTFIL BLKSIZE=7000
    INCLUDE COND=(7,2,CH,EQ,C'11',1,7,2,CH,EQ,C'12')
END
/*
* STEP 2 PRINTING OF TABLE 04B
// ASSGN SYS001,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// TLBL SYS001,'RAARDA-ST09'
// PAUSE REWIND SCRATCH TAPE ON 282
// EXEC RAARPO4B
1979/80

```

e) RAART048 PARAMETER FORMAT

4.48	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1.	LATEST YEAR COVERED BY SURVEY	1 - 7	X(07) (e.g. 1979/80)
	2.	FILLER	8 - 80	X(73)

iii) JOB RAARTQ7

4.49 This job produces table 07 entitled 'RESOURCE MANAGEMENT SYSTEM'.

a) Operating Instructions

4.50 The input RAARDATA File is assigned to a tape drive which is then read by the program to produce the appropriate table. The necessary JCL statements and parameter formats follow in the next pages.

b) RAART07 JCL STATEMENTS

```
4.51 * $J JOB JNM=RAART07,CLASS=A,USER=OPS04000
      // JOB RAART07
      // LIBDEF CL,SEARCH=JSRCL2
      * $PRT COPY=1
      // ASSIGN SYS001,X'287' INPUT TAPE
      // ASSIGN SYS027,PRINTER
      // TLBL SYS001,'RAARDA'
      // PAUSE LOAD INPUT TAPE ON 287
      // EXEC RAARPO7
      1981
      /*
      /&
      * $EJ EDJ
```

c) RAARTO7 PARAMETER FORMAT

4.52	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	YEAR OF SURVEY	1 - 4	9(04) (e.g. 1981)
	2.	FILLER	5 - 80	X(76)

(iv) JOB RAARTQ8

4.53 This job produces Tables 08A and 08B entitled 'Analysis of Major Scientific Equipment Main Data File Record Type 12' and 'Location And Condition of Major Scientific Equipment' respectively and is run in two job steps:

Job Step 1

The input RAARDATA file is sorted in ascending order of institution code and record type. The output from this job step is a sorted tape file labelled RAARDATA-ST12.

Job Step 2

In this job step, the output tape file from job step 1 is rewound and is assigned to program RAARP08. Also input to this program is the equipment dictionary file labelled RAAREQUP-DATA on a magnetic tape and the institution dictionary file on diskette which is read as a cardfile.

(a) Operating Instructions

4.54 On the job submission sheet, the operator is instructed to type the message:SRDR, OOA, A, 'RAARINST', N where N is the number of diskettes to be read, 'RAARINST' is the common header in all the diskettes with a 'C' in column 45 of every diskette and 'L' in column 45 of the last diskette. The necessary JCL statements and parameter formats follow in the next pages.

b) RAART08 JCL STATEMENTS

```

4.55  ## JJB JNM=RAART08,CLASS=A,USER=OPS04000
      // JJB RAART08
      // LIBDEF CL,SEARCH=JSRCL2
      * ## PRT COPY=1
      // ASSGN SYS001,DISK,VOL=CPWACC,SHR
      // ASSGN SYS002,X'280'
      // ASSGN SYS003,DISK,VOL=CPWACC,SHR
      // TLBL SORTIN1,'RAARDA'
      // DLBL SORTOUT,'RAARDA-ST13',0
      // EXTENT SYS001,CPWACC,1,0,2208,120
      // DLBL SORTWK1,,0
      // EXTENT SYS003,CPWACC,1,0,2328,120
      // PAUSE LOAD INPUT TAPE ON 280
      // EXEC SORT,SIZE=64K
      SORT FIELDS=(1,3,CH,A),WORK=1,FILES=1
      RECD RD TYPE=F,LENGTH=140
      INPFIL BLKSIZE=7000
      OUTFIL BLKSIZE=7000
      END
/*
* STEP 2 PRINTING OF TABLE 08
// ASSGN SYS001,DISK,VOL=CPWACC,SHR
// ASSGN SYS002,DISK,VOL=CPWACC,SHR
// ASSGN SYS003,X'282'
// ASSGN SYS025,READER
// ASSGN SYS027,PRINTER
// DLBL SORTWK1,,0
// EXTENT SYS001,CPWACC,1,0,2328,120
// DLBL SYS002,'RAARDA-ST13'
// EXTENT SYS002,CPWACC,1,0,2208,120
// TLBL SYS003,'RAAREQJP-DATA'
// PAUSE LOAD INPUT TAPE ON 282
// EXEC RAARPO8
1979/80

```

c) RAART08 PARAMETER FORMAT

4.56	<u>FIELD</u>	<u>DESCRIPTION</u>	<u>POSITION</u>	<u>CLASS</u>
	1	LATEST YEAR COVERED BY SURVEY	1 - 7	X(07) (e.g. 1979/80)
	2	FILLER	8 - 80	X(73)

CHAPTER V

OBSERVATIONS AND RECOMMENDATIONS

5.1 The initial estimates of time requirement for the computer exercise were very modest as has been shown by the length of time it has taken to key data, code, design, and implement a system that can reliably analyse the vital data dealing with Resource Allocation in Agricultural Research in Kenya.

5.2 On the whole it has taken about 5 man months to design and code the questionnaire, about 2 man months to key the data and about 12 man months to design and implement the computer system. Cleaning of data through the computer took additional time.

Considering these difficulties it is felt that the computer system is now quite viable for the purpose for which it was intended namely to record and analyse data in research activities both for the present time, as well as for the continuing future.

5.3 It is recommended that for subsequent update of data in the RAARES Computer System, emphasis be placed on the cleanliness of data and that the amendment forms, which are provided be used.

5.4 It is further recommended that this computer system should be adapted to accommodate the general documentation and registration of all research projects in Kenya.

PRINT LAYOUTS

[illegible]

APPENDIX I (CONTD)

DD/MM/YY

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

PAGE:XXX

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

TABLE #18

MANPOWER RESOURCES IN RESEARCH INSTITUTIONS 1999/00 (SUMMARY)

INSTITUTION CODE & NAME:- XXX XXX												
RESEARCH OFFICERS					TECHNICAL SUPPORT			OTHER SUPPORT				
CODE	INSTITUTION NAME	PHD	MSc	BSc	TOTAL R.O.	T.O.	T.A.	TOTAL T.S.	ADMIN.	UNSKILA	TOTAL OTHER	TOTAL STAFF
XXX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
XXX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
XXX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

Page: 2

PAGE XXX.

6

PROJECT NUMBER	PROJECT TITLE	DATE START	DATE EXPIRY	NO OF AVE. STUDENTS	NO OF TECH	PROJECT COST KENYA POUNDS
1	NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY					
2	RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH					
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43						
44						

15/10/94

7/80 5:08A

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY						PAGE: XXX
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH						
<u>ANALYSIS OF NATOR SCIENTIFIC EQUIPMENT MAIN DATAFILE RECORD TYPE 12 REXX/XX</u>						
INSTITUTION CODE & NAME :-		XXXX	XX	QUANTITY	CONDITION	XXXXXXXXXXXXXXXXXXXX
EQUIPMENT						
CODE	DESCRIPTION					
01	XX		XXXXXXXXXXXXXXXXXXXX	XX		XXXXXXXXXXXXXXXXXXXX
02	XX		XXXXXXXXXXXXXXXXXXXX	XX		XXXXXXXXXXXXXXXXXXXX
03	XX		XXXXXXXXXXXXXXXXXXXX	XX		XXXXXXXXXXXXXXXXXXXX

[illegible]

NAT / 10 NAL		COUNCIL FOR SCIENCE AND		TECHNOLOGY		PAGE: xxx	
LIST #2		RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH					
		VALUATION CODE LIST - (RAW DATA)					
INST. CODE	SURN. YEAR	PROJECT NUMBER	PROJECT NUMBER	ERROR	MESSAGE		
xxx	xx	xxxxxx	xxxxxx	xxxxxx	xxxxxx		
xxx	xx	xxxxxx	xxxxxx	xxxxxx	xxxxxx		
xxx	xx	xxxxxx	xxxxxx	xxxxxx	xxxxxx		

AD/AM/YY

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

PAGE:XXX

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

VALIDATION ERROR LIST-(AMENDMENTS)

LIST

INST. CODE

SURV. YEAR

REC-TYPE/ITEM CODE

PROGRAMME NUMBER

PROJECT NUMBER

ERROR MESSAGE

XXX

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DD/MM/YY

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

PAGE:XXX

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST OF

UPDATE REPORT

INST. CODE	SURV. YEAR	REC-TYPE/ITEM CODE	PROGRAMME NUMBER	PROJECT NUMBER	UPDATE MESSAGE
XXX	XX	XXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
XXX	XX	XXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
XXX	XX	XXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX

AD/MM/YY

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

PAGE:XXX

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 90A

PROJECT DICTIONARY FILE LISTING (UNSORTED)

<u>NUMBER</u>	<u>DESCRIPTION</u>
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XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX

MD/MNNY

LIST 908

PAGE:YXX

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY	
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH	
PROGRAMME ACTION PLAN LISTING (DISSEMINATION)	
NUMBER	DESCRIPTION
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XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX

LIST 91A

NUMBER	A E S C R I P T I O N
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XXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	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IN/MM/NH	NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY	PAGE:XXX
LIST ONE	RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH FIELDS OF RESEARCH DICTIONARY FIVE LISTING	
	CODE DESCRIPTION	
XX	XXXXXXXXXXXXXXXXXXXXX	
XX	XXXXXXXXXXXXXXXXXXXXX	
XX	XXXXXXXXXXXXXXXXXXXXX	
XX	XXXXXXXXXXXXXXXXXXXXX	

APPENDIX II

A SUMMARY OF LISTS AND TABLES

LIST/TABLE NO	TITLE	TYPE OF FORMS	RECORD TYPES SELECTED	PROGRAM NAME	JOB NAME	FILES USED
TABLE 01A	Manpower Resources in Research Institutions (Detailed)	A	01 & Q2	RAARP01A	RAART01A	1. RAARDA-STA-04:- Input 2. RAARINST:- Input
TABLE 01B	Manpower Resources in Research Institutions (Summary)	A	01 & 02	RAARP01B	RAART01B	1. RAARDA-STA-05:-Input 2. RAARINST:Input
TABLE 02	Financial Resources in Research Institutions - Kenya Pounds	A	03 & 05	RAARP02	RAART02	1. RAARDA-STA-06: Input 2. RAARINST: Input
TABLE 03	Distribution of Resources in Research Institutions	A	01, 02, 04 & 05	RAARP03	RAART03	1. RAARDA-STA-07:Input 2. RAARINST: Input
TABLE 04A	Current Research support for various subject Areas (manpower)	B	09 & 10	RAARP04A	RAART04A	1. RAARSUBJ: Input 2. RAARDA-STA-08: Input
TABLE 04B	Current Research Support for various subject Areas(funding)	B	11 & 12	RAARP04B	RAART04B	1. RAARSUBJ: Input 2. RAARDA-STA-09:Input
TABLE 05A	Utilization of funds by Research Institutions (Government Institutions Pooled)	A	04	RAARP05	RAART05	1. RAARDA-STA-10: Input 2. RAARINST: Input
TABLE 05B	Utilization of funds by Research Institutions (other institution pooled)	A	04	RAARP05	RAART05	1. RAARDA-STA-11: Input 2. RAARINST: Input

APPENDIX II (CONTD.)

LIST/TABLE NO	TITLE	TYPE OF FORMS	RECORD TYPES SELECTED	PROGRAM NAME	JOB NAME	FILES USED
TABLE 06	Current level of support to Research projects	B	09,10,11&12	RAARP06	RAART06	1. RAARDATA-ST11: Input 2. RAARPROJ-ST02: Input 3. RAARINST: Input
TABLE 07	Resource management system	C	13	RAARP07	RAART07	1. RAARDATA : Input
TABLE 08A	Analysis of major Scientific Equipment Main Data File Record Type 12.	B	12	RAARP08A	RAART08A	1. RAAREQUP-DATA : Input 2. RAARDATA-ST 12A:Input 3. RAARINST: Input 4. RAARDATA-ST12A: Output
TABLE 08B	Location and Condition of Major Scientific Equipment	B	Generated from 12	RAARP08B	RAART08B	1. RAAREQUP-DATA: Input 2. RAARDATA-ST 12A: Input 3. RAARINST: Input 4. RAARDATA-ST 12AA: Output
LIST 80	Data File - Diskettes to Tape with validation.	A,B,C	01 to 13	RAARP80	RAART80	1. RAARINPT: Input 2. RAARDATA: Output
LIST 81	Data File Listing (sorted)	A,B,C	01 to 13	RAARP81	RAART81	1. RAARDATA-ST01: Input 2. RAARINST : Input
LIST 82	Validation Error Listing (Raw Data)	A,B,C	01 to 13	RAARP82	RAART82	1. RAARDATA; Input 2. RAARPROJ-DATA-S: Input 3. RAARDATA: Output
LIST 83	Validation Error List (Amendments)	A,B,C	01 to 13	RAARP83	RAART83	1. RAARINPT : Input 2. RAARPROJ-DATA-S: Input 3. RAARTRAN:Output

APPENDIX II (CONTD.)

LIST/TABLE NO	TITLE	TYPE OF FORMS	RECORD TYPES SELECTED	PROGRAM NAME	JOB NAME	FILES USED
LIST 84	Up date Report	A,B,C	Ø1 to 13	RAARP84	RAART84	1.RAARDATA: Input 2.RAARTRAN: Input 3.RAARDATA: Output
LIST 9ØA	Project Dictionary File Listing (Unsorted)	-	-	RAARP9Ø	RAART9Ø	1.RAARPROJ: Input 2.RAARPROG: Input 3.RAARPROJ-DATA: Output 4.RAARPROG-DATA : Output
LIST 9ØB	Programme Dictionary File Listing (Unsorted)	-	-	RAARP9Ø	RAART9Ø	1.RAARPROJ: Input 2.RAARPGRA: Input 3.RAARPROJ-DATA: Output 4.RAARPROG-DATA: Output
LIST 91A	Project Dictionary File Listing (Sorted)	-	-	RAARP91	RAART91	1.RAARPROJ - STØ2 : Input 2.RAARPROG - STØ3 : Input
LIST 91B	Programme Dictionary File Listing (Sorted)	-	-	RAARP91	RAART91	1.RAARPROJ - STØ2 : Input 2.RAARPROG - STØ3 : Input
LIST 92A	Institution Dictionary File Listing	-	-	RAARP92	RAART92	1.RAARINST : Input 2.RAARSUBJ: Input 3.RAARFLDS: Input 4.RAAREQUP: Input
LIST 92B	Subject Area Dictionary File Listing	-	-	RAARP92	RAART92	1.RAARINST: Input 2.RAARSUBJ: Input 3.RAARFLDS: Input 4.RAAREQUP: Input

APPENDIX II (CONTD.)

LIST/TABLE NO	TITLE	TYPE OF FORMS	RECORD TYPE SELECTED	PROGRAM NAME	JOB NAME	FILE USED
LIST 92C	Fields of Research Dictionary Fill listing	-	-	RAARP92	RAART92	1. RAARINST: Input 2. RAARSUBJ: Input 3. RAARFLDS: Input 4. RAAREQUP: Input
LIST 92D	Major Scientific Equipment Dictionary File Listing	-	-	RAARP92	RAART92	1. RAARINST: Input 2. RAARSUBJ: Input 3. RAARFLDS: Input 4. RAAREQUP: Input

APPENDIX III

AN EXAMPLE OF LIST AND TABLE PRINTOUTS

PAGE: 1

25/02/83 NAT I C N A L C C U A C I L F C R S C I E N C E A N D T E C H N O L O G Y
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

TABLE 31A MANPOWER RESOURCES IN RESEARCH INSTITUTIONS 1979/80 (DETAILED)

INSTITUTION CODE & NAME:-- 030 KARI-ARC

YEAR	DIRECTOR OR OFFICER I/C - QUALIFICATIONS	R E S C A R C F	C F I C E R S	TOTAL R.O.	T.C.	T.A.	TOTAL T.S.	ADMIN.	UNSKILD	TOTAL CTHER	TOTAL STAFF
1970/71	---	---	---	---	---	---	---	---	---	---	---
1971/72	---	---	---	---	---	---	---	---	---	---	---
1972/73	---	---	---	---	---	---	---	---	---	---	---
1973/74	---	---	---	---	---	---	---	---	---	---	---
1974/75	---	---	---	---	---	---	---	---	---	---	---
1975/76	---	---	---	---	---	---	---	---	---	---	---
1976/77	---	---	---	---	---	---	---	---	---	---	---
1977/78	---	---	---	---	---	---	---	---	---	---	---
1978/79	---	---	---	---	---	---	---	---	---	---	---
1979/80	DSC PHD	4	30	15	49	16	74	90	386	483	622
AVERAGE 1979/80	P.A.	4	30	15	49	---	---	---	---	---	---

TABLE C1B
MANPOWER RESOURCES IN RESEARCH INSTITUTIONS 1979/80 (SUMMARY)

CODE	INSTITUTION NAME	R E S E A R C H				C O U N C I L				F O R				S C I E N C E				A N D				T E C H N O L O G Y				TOTAL STAFF
		PHD	MSC	BSC	TOTAL R.O.	T.O.	T.A.	TOTAL T.S.	ADMIN.	UNSKILD	TOTAL CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH	CTH
C30	KARI-ARC	4	30	15	49	16	74	90	97	386	483															622
C40	CRF	4	11	6	21	12	3	15	130	681	811															847
C41	TRF	1	2	1	4	5	23	28	15	161	176															208
C50	ICC	0	3	3	6	0	3	3	17	2	19															28
C61	MARS KITALE	5	5	37	47	10	40	50	35	182	221															318
C62	MARS KAKAMEGA	0	3	4	7	6	28	34	17	70	87															128
C63	CRS KIBCS	0	1	5	6	1	14	15	6	24	30															51
C64	MSRC KIPUS	1	7	0	8	4	20	24	25	43	68															100
C65	MARS KISII	0	2	3	5	5	19	24	14	0	14															43
C66	PHRS MULD	0	2	6	8	10	20	30	29	98	127															165
C67	MPUS NJCRJ	4	3	0	7	10	15	25	17	38	55															87
C68	MSUS LANET	1	2	13	16	21	22	43	27	25	52															111
C69	MAHRS NAIVASHA	0	4	4	8	11	27	38	27	220	247															293
C70	IRJ LANET	0	2	1	3	4	1	5	22	45	67															75
C71	ARS NYANDARUA	0	0	2	2	4	6	10	16	44	60															72
C72	PRS TICONI	0	2	9	11	8	17	25	15	0	15															51
C74	NAL NAIRABI	1	20	39	60	36	70	106	58	97	155															321
C75	ARS EMBU	0	0	4	4	3	12	16	13	67	80															100
C76	ARS TIGERE	0	2	8	10	0	14	14	13	67	80															104
C77	MPUS THIKA	5	14	22	41	44	4	48	41	130	171															260
C78	MSUS LANET	4	4	7	14	33	0	33	18	86	104															153

25/03/83

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

PAGE:

TABLE 12

FINANCIAL RESOURCES IN RESEARCH INSTITUTIONS-KENYA POUNDS

INSTITUTION CODE & NAME:- 030 KARI-ARI

YEAR ----	RECURRENT -----	DEVELOPMENT -----	TOTAL LOCAL FUNDS -----	AID ---	OVERALL TOTAL -----
1970/71	---	---	---	---	---
1971/72	---	---	---	---	---
1972/73	---	---	---	---	---
1973/74	---	---	---	---	---
1974/75	---	---	---	---	---
1975/76	---	---	---	---	---
1976/77	---	---	---	---	---
1977/78	---	---	---	---	---
1978/79	---	---	---	---	---
1979/80	1311389	362160	1673549	---	1673549
AVERAGE GROWTH P.A.	0	0	0	0	0

NOTE: --- = INFORMATION NOT AVAILABLE

N A T I O N A L C O L L E G I A L F O R S C I E N C E A N D T E C H N O L O G Y
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

DISTRIBUTION OF RESOURCES IN RESEARCH INSTITUTIONS AS AT 31ST DEC 1980

TABLE Q3

INSTITUTION CODE & NAME	ECC-ZONE	NC.R.C.	TECHNICAL STAFF	R.O.C. : TECH.	PERSONAL EMPLOYMENTS K.POUNDS	OPERATIONAL CCST K.POUNDS	TOTAL PE,UC K.POUNDS
C30 KARI-AFC	C	49	90	1 : 2	---	---	---
C40 CFF	2	21	15	1 : 1	43000	53000	96000
C41 TRF	2	4	28	1 : 7	53056	44076	97132
C50 IDS	2	6	3	2 : 1	87797	74450	162247
C61 NARS KITALE	2	47	50	1 : 1	---	2253322	2253322
C62 NARS KAKAMEGA	2	7	34	1 : 5	---	64781	64781
C63 CFS KIECS	2	6	15	1 : 3	---	5500	5500
C64 NARS KIBCS	2	8	24	1 : 3	4210	36668	40878
C65 NARS KISII	2	5	24	1 : 5	---	---	---
C66 FRS MLC	2	8	30	1 : 4	45088	55257	100345
C67 NARS NJORO	2	7	25	1 : 4	23654	59131	82825
C68 NARS LANET	2	16	42	1 : 3	206668	211917	420585
C69 NARS NAIVASHA	4	8	38	1 : 5	---	---	---
C70 EFS LANET	2	3	5	1 : 2	---	42887	42887
C71 FRS NYANJARUA	2	2	10	1 : 5	45012	42515	87531
C72 FRS TICUNI	2	11	25	1 : 2	---	---	---
C74 NAL NAIRORI	2	60	106	1 : 2	---	144816	144816
C75 FRS EMUL	2	4	16	1 : 4	---	---	---
C76 FRS TEERE	3	10	14	1 : 1	---	---	---
C77 NARS THIKA	2	41	48	1 : 1	406546	610470	1017016
C79 FRS KIBCK	5	16	33	1 : 2	143370	247515	390885
C82 FRS MTHABA	2	13	8	2 : 1	156555	59325	215920

25/03/83

N A T I O N A L C O U N C I L F O R S C I E N C E A N D T E C H N O L O G Y
 RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH
 CURRENT RESEARCH SUPPORT FOR VARIOUS SUBJECT AREAS - 1979/80 (MANPOWER)

PAGE: 5

TABLE C4A

S U B J E C T A R E A

*****M A N P O W E R *****

	PHD		MSC		BSC		TO/TECNOL	TA/TECNIC	TOTAL
	K	O	K	O	K	O			
C02 SCIL IN GENERAL	0	0	9	1	2	0	2	17	31
C03 SCIL COMPOSITION-GENERAL	0	1	0	0	1	0	1	2	5
C07 SCIL COMPOSITION-OTHER	2	3	0	0	0	0	2	0	7
C09 BIO-COMMUNITIES IN THE SCIL	0	3	1	0	0	0	0	1	5
C19 RANGE, UNCULTIVATED LAND AND NATURAL VEGETATION IN GENERAL	0	2	3	0	2	0	5	0	12
C21 OTHER SUBJECTS RELATED TO RANGE, UNCULTIVATED LAND & VEG	0	3	2	0	0	0	0	1	6
C23 ARBORETA AND BOTANICAL GARDENS	0	1	0	0	0	0	0	1	2
C31 PLANTS AND PARTS OF PLANTS IN GENERAL	0	1	0	1	1	0	1	3	7
C32 PLANT COMMUNITIES AS ECOLOGICAL SYSTEMS	0	0	1	0	0	0	1	6	8
C34 ANIMALS COMMUNITIES AS ECOLOGICAL SYSTEMS	0	0	1	0	0	0	0	0	1
C35 ANIMALS AND PLANT COMMUNITIES AS ECOLOGICAL SYSTEMS	0	3	0	0	0	0	2	0	5
C36 ANIMAL DISEASES	3	1	1	1	0	0	0	0	6
C38 CROPS IN GENERAL	4	14	5	0	4	1	5	19	52
C39 CEREALS IN GENERAL	0	0	0	0	1	0	2	2	5
C40 BARLEY	0	1	2	1	2	1	0	3	10
C41 MAIZE	3	2	19	2	12	1	20	40	99
C42 CATS	0	0	1	0	0	0	0	14	15
C43 RICE	0	0	0	0	3	0	0	1	4
C45 SORGHUM & MILLET	0	0	1	3	4	0	1	9	18
C46 WHEAT	1	2	3	0	5	0	0	45	56

NOTE: K = KENYAN , C = OTHER NATIONALITIES

TABLE 348 RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH CURRENT RESEARCH SUPPORT FOR VARIOUS SUBJECT AREAS - 1979/80 (FUNDING)

S L B J E C T A R E A	*****F U A C I N G - KENYA POUNDS*****	***R E C U R R E N T** CAPITAL	T O T A L
-----	PERSCANEL OPERATING TOTAL P/O	-----	-----
C02 SOIL IN GENERAL	76425	9156	85581
C03 SOIL COMPOSITION-GENERAL	2333	278	2611
C07 SOIL COMPOSITION-OTHER	11000	200	11200
C09 BIO-COMMUNITIES IN THE SOIL	4604	2000	6604
C19 RANGE, UNCULTIVATED LAND AND NATURAL VEGETATION IN GENERAL	23254	13313	36567
C21 OTHER SUBJECTS RELATED TO RANGE, UNCULTIVATED LAND & VEG	3793	14000	17793
C23 ARBORETA AND BOTANICAL GARDENS	500	3000	3500
C31 PLANTS AND PARTS OF PLANTS IN GENERAL	25419	13536	42955
C32 PLANT COMMUNITIES AS ECOLOGICAL SYSTEMS	600	4000	4600
C34 ANIMALS COMMUNITIES AS ECOLOGICAL SYSTEMS	3114	3000	6114
C35 ANIMALS AND PLANT COMMUNITIES AS ECOLOGICAL SYSTEMS	21506	5000	26506
C36 ANIMAL DISEASES	---	12000	12000
C38 CRUPS IN GENERAL	286510	138700	427210
C39 CEREALS IN GENERAL	7700	---	7700
C40 EARLEY	13344	14100	27444
C41 MAIZE	156760	54025	210785
C42 CATS	200	500	700
C43 RICE	3250	5000	8250
C45 SCRUGHUM & MILLET	51776	19322	71098
C46 WHEAT	34095	---	34095

28/03/83

N A T I O N A L C O U N C I L F O R S C I E N C E A N D T E C H N O L O G Y
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

PAGE: 7

TABLE 5-

UTILIZATION OF FUNDS BY RESEARCH INSTITUTIONS AS AT 1979/80

GOVERNMENT INSTITUTIONS PROVIDED

NOTE: --- = INFORMATION NOT AVAILABLE

INSTITUTION CODE & NAME :- 030 KARL-ARD

CODE	ITEM OF EXPENDITURE	PROVIDED	USED	%USED/PROV
000	PERSONAL EMOLUMENTS	751676	---	---
050	HOUSE ALLOWANCES	53774	---	---
100	TRANSPORT OPERATING EXPENSES	62200	---	---
110	TRAVELLING AND ACCOMMODATION EXPENSES	52389	---	---
120	POSTAL AND TELECOM EXPENSES	24500	---	---
140	ELECTRICITY WATER AND CONSERVANCY	201800	---	---
150	DRUGS SERA VACCINES AND PESTICIDES	---	---	---
151	PURCHASE OF LIVESTOCK	---	---	---
153	FARM INPLTS	30000	---	---
154	TRAINING AND SEMINARS	8543	---	---
160	FOOD AND RATIONS	20000	---	---
172	UNIFORMS AND CLOTHING	25000	---	---
173	LIBRARY EXPENSES	28475	---	---
174	STATIONERY AND PRINTING	56900	---	---
180	HIPING RENTS AND RATES	15125	---	---
190	MISCELLANEOUS AND OTHER CHARGES	11587	---	---
200	REPLACEMENT OF TRANSPORT	63500	---	---
210	ADDITIONAL TRANSPORT	28510	---	---
220	OFFICE EQUIPMENT	12282	---	---
222	PLANT AND EQUIPMENT	130610	---	---
250	MAINTENANCE OF STATIONS	48500	---	---
3.2	NATIONAL COOPERATIVE TRIALS	---	---	---
340	GRANTS FOR COMMUNITY RESEARCH	---	---	---
	TOTAL	1707771	---	---

25/03/83

N A T I O N A L C O U N C I L F O R S C I E N C E A N D T E C H N O L O G Y
RESOURCES ALLOCATION IN AGRICULTURAL RESEARCH

PAGE: 8

TABLE 06

CURRENT LEVEL OF SUPPORT TO RESEARCH PROJECTS

1979/80

INSTITUTION CODE & NAME :- 030 KARI-ARD

PROJECT NUMBER	P R C J E C T T I T L E	DATE START	DATE ENDED	NO OF R.O.	AVE. %TIME	NO OF TECH	PROJECT COST KENYA POUNDS
030100202810039	SOIL PHYSICS	1980	1984	2	100	4	57600
030100202810051	MINIMUM TILLAGE	1979	-ON-	1	25	1	7500
030100310810042	FERTILIZER REQUIREMENTS IN DRYLAND AREAS	1981	1984	3	33	4	2611
030100501810043	SELECTION, ISOLATION AND TESTING OF RHIZOBIA STRAINS FOR	1980	1983	4	25	2	6604
030103802810041	DEVELOPING IRRIGATION GUIDELINES USING PLANT STRESS CRITERIA	1981	1984	5	0	6	4200
030103809810035	AGRONOMICAL ASPECTS	1979	1984	2	100	5	57600
030103814810036	CROP PROTECTION IN DRYLAND AREAS	1981	1984	1	100	0	57600
030103814810046	ARMYWORM CONTROL	1977	1982	5	47	4	144000
030104104810038	AGROMETEOROLOGY	1977	1984	3	100	4	57600
030105414910047	CROP VIROLOGY RESEARCH	1980	1983	3	100	13	71667
030105418810056	THREE DIFFERENT SOURCES OF ENERGY IN SUPPLYING RATINGS OF BE	1980	1981	1	100	4	---
030105512810044	DETERMINATION OF ECONOMIC IMPORTANCE OF POTATO TUBER MOTH	1981	1986	1	60	1	1500
030106312810050	INTEGRATED PEST MANAGEMENT OF MAJOR PIGEON PEA INSECT PESTS	1981	-ON-	2	80	4	10000
030107114810048	CROP VIROLOGY PROJECT	1981	-ON-	2	13	10	---
030108012810049	IDENTIFICATION OF VIRUS PATHOGEN IN BANANA, ITS TRANSMISSION	1980	-ON-	2	50	6	---
030110813810045	RELATIONSHIP BETWEEN MOTH CATCHES IN TRAPS AND OUTBREAKS OF	--	-ON-	1	30	6	3000
030111856810037	AGRICULTURAL ECONOMICS	1980	1984	2	65	0	57600
030205818810055	FORAGE PRODUCTION IN RANGELANDS	1974	-ON-	1	100	5	16000
030211619310057	REPRODUCTION PERFORMANCE OF BEEF CATTLE ON RANGE	1978	1983	1	100	7	---
030511856810040	ECONOMICS OF VARIOUS CROPPING SYSTEMS	1981	1981	4	25	3	3600

TABLE 07 R E S O U R C E A L L O C A T I O N I N A G R I C U L T U R A L R E S E A R C H R E S O U R C E M A N A G E M E N T S Y S T E M A S O F 1981

QUESTIONS AND MULTIPLE ANSWERS		YES	NO	NO. OF INTERVIEWEES	TOTAL NO. OF ANSWERS OBTAINED	% AFFIRMATIVE
1. WPC DETERMINES RESEARCH PRIORITIES ?						
1.01 INDIVIDUAL SCIENTISTS		13	16	29	29	40
1.02 PROGRAMME LEADERS		23	6	29	29	70
1.03 TCP MANAGEMENT		10	19	29	29	30
1.04 COMMITTEES OF MAN. & SCIENTIST		24	5	29	29	80
1.05 DCNR AGENCIES		6	23	29	29	20
1.06 OTHERS		2	27	29	29	0
2. ON WHAT BASIS ARE PRIORITIES DETERMINED ?						
2.01 RESPONSE TO EMERGENCIES		17	12	29	29	50
2.02 RESPONSE TO VALUE OF PRODUCT		21	8	29	29	70
2.03 POTENTIAL FOR PRODUCTION		24	5	29	29	80
2.04 IMPACT SUBSTITUTION		7	22	29	29	20
2.05 FOREIGN EXCHANGE EARNINGS		14	15	29	29	40
2.06 LAND UTILIZATION		16	13	29	29	50
2.07 DCNR INFLUENCE		5	24	29	29	10
2.08 SCIENTIFIC ADVANCEMENT		14	15	29	29	40
2.09 DEVELOPMENT PLANS		25	4	29	29	80
2.10 OTHERS		4	25	29	29	10
3. HOW ARE RESEARCH FUNDS ALLOCATED ?						
3.01 QUARTERLY		0	29	29	29	0

25/03/83

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

PAGE: 10

TABLE: 08A

ANALYSIS OF MAJOR SCIENTIFIC EQUIPMENT MAIN DATAFILE RECORD TYPE 12 1979/80

INSTITUTION CODE & NAME :- C30 KARI-ARD

EQUIPMENT		QUANTITY	CONDITION
CODE	DESCRIPTION		
38	SPECIALISES CVEN	2	NOT OPERATIONAL
35	LYSIMETERS	1	GOOD
38	SPECIALISES CVEN	3	POOR
00		0	
11	RESEARCH MICROSCOPE	2	GOOD
07	CENTRIFUGE - HIGH SPEED	1	GOOD
34	COMPUTER - MAGNETIC DISC/TAPE AND FULL SIZE PRINTER	1	GOOD
38	SPECIALISES CVEN	3	NOT OPERATIONAL
44	KARL KOA MILL.	1	NOT OPERATIONAL
08	AUTOCLAVE	1	POOR
00		0	
38	SPECIALISES CVEN	1	FAIR
00		0	

25/03/83

18 ROTARY EVAPORATORS 1 FAIR
 NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY
 RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

PAGE: 11

TABLE: 088

LOCATION AND CONDITION OF MAJOR SCIENTIFIC EQUIPMENT 1979/80

INSTITUTION CODE & NAME :- C30 KARI-ARC

EQUIPMENT	QUANTITY	CONDITION
CODE DESCRIPTION	-----	-----
07 CENTRIFUGE - HIGH SPEED	1	GOOD
08 AUTOCLAVE	1	POOR
11 RESEARCH MICROSCOPE	2	GOOD
34 COMPUTER - MAGNETIC DISC/TAPE AND FULL SIZE PRINTER	1	GOOD
35 LYSIMETERS	1	GOOD
38 SPECIALISES CVEN	1	FAIR
38 SPECIALISES CVEN	3	POOR
38 SPECIALISES CVEN	5	NOT OPERATIONAL
44 KARL KGA MILL.	1	NOT OPERATIONAL

**LIST 80 - DATA FILE - DISKETTES TO TAPE
WITH VALIDATION**

[illegible]

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

13 1587

C A T A L I S T I N G (S C R T E D)

INSTITUTION CODE & NAME :- 030 KARI-ARD

[illegible]

25/03/83

N A T I O N A L C O U N C I L F O R S C I E N C E A N D T E C H N O L O G Y

PAGE: 14

R E S O U R C E A L L O C A T I O N I N A G R I C U L T U R A L R E S E A R C H

L I S T 82

V A L I D A T I O N E R R O R L I S T - (R A W D A T A)

INSTR. CODE	SURV. YEAR	REC-TYPE/ITEM CODE	PROGRAMME NUMBER	PROJECT NUMBER	E R R O R M E S S A G E
C64	81	C4173			PROVIDED OR USED AMT ERROR
C63	81	05			BUDGET YEAR ERROR
C66	81	C5			EXP. AMOUNT ERROR
C76	81	C4C50			PROVIDED OR USED AMT ERROR
C76	81	C41CC			PROVIDED OR USED AMT ERROR
C66	81	C32			AMOUNT ERROR
C30	81	C5			BUDGET YEAR ERROR
C62	81	C32			AMOUNT ERROR
C77	81	C32			AMOUNT ERROR
C41	81	C1			DIRECTOR NAME ERROR
C62	81	C52	082106305810002	082106009810001	NATIONALITY ERROR
C62	81	C6	082108513810001	082108513810001	PROG. NUMBER ERROR
C62	81	C7	082108513810001	082108513810001	--DO--
C62	81	C8	082108513810001	082108513810001	--DO--
C62	81	C51	082108513810001	082108513810001	--DO--
C62	81	C6	082108513810001	082108513810001	--DO--
C62	81	C11	082108513810001	082108513810001	--DO--
C62	81	C12	082108513810001	082108513810001	--DO--
C41	81	C52	041105811810004	041105811810005	NATIONALITY ERROR
C41	81	C51	041105859810004	041105859810004	NATIONALITY ERROR
C69	81	C52	069211318810002	069211318810003	NATIONALITY ERROR
C69	81	C51	069211430810002	069211430810001	NATIONALITY ERROR
C69	81	C52	069211430810002	069211430810001	NATIONALITY ERROR
C69	81	C53	069211430810002	069211430810001	NATIONALITY ERROR
					NATIONALITY ERROR

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

L I S T 83

VALIDATION ERROR LIST-(AMENDMENTS)

<u>INST. CODE</u>	<u>SURV. YEAR</u>	<u>REC-TYPE/ITEM-CODE</u>	<u>PROGRAMME NUMBER</u>	<u>PROJECT NUMBER</u>	<u>E R R O R M E S S A G E</u>
030	81	092	030103814810013	030103814810046	QUALIFICATION ERROR
040	81	06			PROG. NUMBER ERROR
040	81	091	040109855810001	040109810810001	PROG. NUMBER ERROR
040	81	092	040109855810001	040109810810001	PROG. NUMBER ERROR
040	81	10	040109855810001	040109810810001	PROG. NUMBER ERROR
040	81	11	040109855810001	040109810810001	RECURRENT AMOUNT ERROR
040	81	11	040109855810001	040109810810001	PROG. NUMBER ERROR
040	81	12	040109855810001	040109810810001	PROG. NUMBER ERROR
051	81	091	051211320810002	051211320810001	PROJ. NUMBER ERROR
055	81	06	055104356810001	055104356810005	PROG. NUMBER ERROR
055	81	091	055104356810001	055104356810005	PROG. NUMBER ERROR
055	81	10	055104356810001	055104356810005	PROG. NUMBER ERROR
055	81	11	055104356810001	055104356810005	RECURRENT AMOUNT ERROR
055	81	11	055104356810001	055104356810005	PROG. NUMBER ERROR
055	81	12	055104356810001	055104356810005	PROG. NUMBER ERROR

25/03/83

PAGE: /6

N A T I O N A L C O U N C I L F O R S C I E N C E A N D T E C H N O L O G Y

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

L I S T 84

U P D A T E R E P O R T

INST. CODE	SURV. YEAR	REC-TYPE/ITEM-CODE	PROGRAMME NUMBER	PROJECT NUMBER	U P D A T E M E S S A G E
030	81	091	030103814810013	030103814810046	INSERTED
030	81	093	030103814810013	030103814810046	INSERTED
030	81	094	030103814810013	030103814810046	INSERTED
030	81	091	030103814810013	030105414810047	INSERTED
030	81	091	030205816810016	030205816810055	INSERTED
030	81	091	030211619810016	030211619810057	INSERTED
C40	81	07	040109855810001	040109810810001	INSERTED
C55	81	08	055104356810001	055104356810005	INSERTED

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 5CA

PROJECT DICTIONARY FILE LISTING (UNSORTED)

N U M B E R	D E S C R I P T I O N
075104163810002	HUSBANDRY PRACTICES
075106309810001	AGRONOMY
075104163810001	MAIZE & BEANS INTERCROPPING
075105009810001	FOOD CROPS AGRONOMY
075104111810002	MEDIUM MATURITY MAIZE VARIETIES (TRIALS)
075104109810001	MAIZE AGRONOMY
077203363810003	REELING (SPINNING)
077203363810002	SILKWORM REERING
077103109810001	MULBERRY AGRONOMY
077106313810001	PEST CONTROL
077106709810004	VEGETABLE AGRONOMY
077106809810003	VEGETABLE AGRONOMY
077106611810002	VEGETABLE SEED PRODUCTION
077106836810001	DETERMINATION OF C AND VIT A IN INDEPENDENT VEGETABLES
077105436810001	QUALITY ASPECTS OF CASSAVA
077106311810006	BREEDING BEANS FOR RESISTANCE TO HALO BLIGHT
077106111810005	BEAN AGRONOMY
077106101810004	BEAN AGRONOMY
077106156810003	BEAN AGRONOMY
077106114810002	BEAN PATHOLOGY
077106111810001	BEAN BREEDING SECTION
077106309810010	BANANA AGRONOMY
077106209810009	CITRUS AGRONOMY
077107611810008	FRUIT INTRODUCTION AND TISSUE CULTURE
077108609810007	PASSION FRUIT DEVELOPMENT

LIST 5CB

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH
PROGRAMME DICTIONARY FILE LISTING (UNSORTED)

N U M B E R	D E S C R I P T I O N
075104105810004	GRAIN LEGUME IMPROVEMENT
075106305810004	GRAIN LEGUME PROJECT
075104105810003	AGRICULTURE
075105805810002	FORAGE CROPS AGRICULTURE
075104111810001	MAIZE IMPROVEMENT
075104105810001	MAIZE IMPROVEMENT
077103105810006	SERICULTURE
077103105810006	SERICULTURE
077106313810005	CROP PROTECTION
077106605810004	VEGETABLE IMPROVEMENT
077106605810004	VEGETABLE IMPROVEMENT
077106611810004	VEGETABLE IMPROVEMENT
077106638810004	NUTRITION VALUE OF INDIGENOUS VEGETABLES
077105438810003	CASSAVA RESEARCH DEVELOPMENT
077106311810002	SCREENING BEANS FOR RESISTANCE TO DISEASES
077106111810002	GRAIN LEGUME IMPROVEMENT
077106105810002	GRAIN LEGUME IMPROVEMENT
077106105810002	GRAIN LEGUME IMPROVEMENT
077106114810002	GRAIN LEGUME IMPROVEMENT
077106111810002	GRAIN LEGUME IMPROVEMENT
077107605810001	FRUIT TREES IMPROVEMENT
077107605810001	FRUIT IMPROVEMENT
077107611810001	PLANT INTRODUCTION & TISSUE CULTURE
077106605810001	SMALL FRUITS

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 91A

PROJECT DICTIONARY FILE LISTING (SORTED)

N U M B E R	D E S C R I P T I O N
030100202810039	SOIL PHYSICS
030100202810051	MINIMUM TILLAGE
030100210610042	FERTILIZER REQUIREMENTS IN DRYLAND AREAS
030100501810043	SELECTION, ISOLATION AND TESTING OF RHIZOBLIA STRAINS FOR
030103802810041	DEVELOPING IRRIGATION GUIDELINES USING PLANT STRESS CRITERIA
030103805810035	AGRONOMICAL ASPECTS
030103814810036	CROP PROTECTION IN DRYLAND AREAS
030103814810046	ARMYWORM CONTROL
030104104810038	AGROMETEOROLOGY
030105414810047	CROP PHYSIOLOGY RESEARCH
030105416810056	THREE DIFFERENT SOURCES OF ENERGY IN SUPPLEMENTAL RATIONS OF BEEF C
030105512810044	DETERMINATION OF ECONOMIC IMPORTANCE OF POTATO TUBER MOTH
030106312810050	INTEGRATED PEST MANAGEMENT OF MAJOR PIGEON PEA INSECT PESTS
030107114310048	CROP PHYSIOLOGY PROJECT
030108012810049	IDENTIFICATION OF VIRUS PATTERNS IN BANANA, ITS TRANSMISSION
030110813810045	RELATIONSHIP BETWEEN MOTH CATCHES IN TRAPS AND OUTBREAKS OF ARMY
030111856810037	AGRICULTURAL ECONOMICS
030205816810055	FORAGE PRODUCTION IN RANGELANDS
030211616810057	REPRODUCTION PERFORMANCE OF BEEF CATTLE ON RANGE
030911856710040	ECONOMICS OF VARIOUS CROPPING SYSTEMS
030911856810040	ECONOMICS OF VARIOUS CROPPING SYSTEMS
030912021810052	LOW COST FARM IMPLEMENTS
032603206810001	AUTOECOLOGY OF JUNIFERUS PROCEPERA
032605211810002	SPECIES AND PROVENANCE TRIALS

LIST 518

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

PROGRAMME DICTIONARY FILE LISTING (SORTED)

N U M B E R	D E S C R I P T I O N
7611171581002	AGRONOMY
030100202810012	DRYLAND CROPPING SYSTEMS RESEARCH
030100202810014	AGRICULTURE ENGINEERING
030100310810012	DRYLAND CROPPING SYSTEMS RESEARCH
030100504810012	SOIL FERTILITY
030103802810012	DRYLAND CROPPING SYSTEMS RESEARCH
030103806810012	DRYLAND CROPPING SYSTEMS RESEARCH
030103805810012	DRYLAND CROPPING SYSTEMS RESEARCH
030103814810001	DRYLAND CROPPING SYSTEMS RESEARCH
030103814810012	CROP PROTECTION
030103814810012	CROP PROTECTION
030105512810012	CROP PROTECTION
030106312810012	CROP PROTECTION
030107114810012	CROP PROTECTION
030108012810012	CROP PROTECTION
030110812810012	CROP PROTECTION
030111856810012	DRYLAND CROPPING SYSTEMS RESEARCH
030205418810016	ANIMAL PRODUCTION
030205818810016	ANIMAL PRODUCTION
030211615810016	ANIMAL PRODUCTION
030511856810040	DRYLAND CROPPING SYSTEMS RESEARCH
030512021810014	AGRICULTURE ENGINEERING
032603206810002	FOREST ECOLOGY
032605211810002	TREE BREEDING

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 52A-

INSTITUTION DICTIONARY FILE LISTING

C O D E D E S C R I P T I O N

001 NCST

002 ASARC

003 NSARC

004 ISARC

005 MSARC

006

007

008

009

010 KARI GENERAL

011 KETRI GENERAL

012 KMFRI GENERAL

013 KIRDI GENERAL

014 KMRI GENERAL

015 KAKFI GENERAL

016 KARI GENERAL

017 ECERTON COLLEGE

018

019

020 MINISTRY OF AGRICULTURE

021 MINISTRY OF LIVESTOCK DEVELOPMENT

022 MINISTRY OF HEALTH

023 MINISTRY OF ENERGY

024 MINISTRY OF INDUSTRY

025 MINISTRY OF EDUCATION

25/03/83

N A T I O N A L C O U N C I L F O R S C I E N C E A N D T E C H N O L O G Y

PAGE: 22

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 929

SUBJECT AREA DICTIONARY FILE LISTING

CODE	DESCRIPTION
001	BIOSPHERE IN GENERAL
002	SOIL IN GENERAL
003	SOIL COMPOSITION-GENERAL
004	SOIL COMPOSITION-INORGANIC
005	SOIL COMPOSITION-ORGANIC
006	SOIL COMPOSITION-SOIL AIR, SOIL WATER
007	SOIL COMPOSITION-OTHER
008	SOIL STRUCTURE
009	BIO-COMMUNITIES IN THE SOIL
010	OTHER SUBJECTS RELATED TO SOIL
011	WATER IN GENERAL
012	WATER COMPOSITION
013	BIO-COMMUNITIES IN THE WATER
014	OTHER SUBJECTS RELATED TO WATER
015	AIR AND CLIMATE IN GENERAL
016	EXTERNAL CLIMATE
017	INTERNAL CLIMATE
018	OTHER SUBJECTS RELATED TO AIR AND CLIMATE
019	RANGE, UNCULTIVATED LAND AND NATURAL VEGETATION IN GENERAL
020	NATURAL SHORT VEGETATION AND WEEDS
021	OTHER SUBJECTS RELATED TO RANGE, UNCULTIVATED LAND & VEG
022	WATER AND RIVERBASINS IN GENERAL
023	SEES, LAKES, RIVERS, POOLS IN GENERAL
024	LAKES, RIVERS, POOLS AND RELATED FRESH WATER ECOSYSTEM

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 52C

FIELDS OF RESEARCH DICTIONARY FILE LISTING

CODE	D E S C R I P T I O N
01	SOIL SCIENCE
02	LAND AND WATER MANAGEMENT
03	DRAINAGE, IRRIGATION AND WATER SUPPLY
04	SOIL IMPROVEMENT
05	SURVEYING
06	NATURE CONSERVATION
07	PLANNING LAND USE
08	LAND CONSOLIDATION AND LAND LAYOUT
09	PLANT PRODUCTION GENERAL AND CRP HOUSEANDRY
10	PLANT NUTRITION AND FERTILIZATION
11	PLANT BREEDING
12	PLANT PROTECTING
13	PESTS OF PLANTS AND PEST CONTROL
14	PLANT DISEASE AND DISEASE CONTROL
15	WEEDS AND WEED CONTROL
16	MISCELLANEOUS PLANT DISORDERS
17	ANIMAL MANAGEMENT GENERAL AND ANIMAL HUSBANDRY
18	ANIMAL NUTRITION
19	ANIMAL BREEDING
20	ANIMAL DISEASE, VETERINARY MEDICINE
21	ENGINEERING - EQUIPMENT
22	ENGINEERING - BUILDINGS
23	CIVIL ENGINEERING
24	TECHNOLOGY
25	HARVESTING

25/03/83

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

PAGE: 24

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

LIST 920

MAJOR SCIENTIFIC EQUIPMENT DICTIONARY FILE LISTING

CODE	DESCRIPTION
01	SPECTROPHOTOMETER
02	ATOMIC ABSORPTION SPECTROPHOTOMETER
03	COLORIMETER
04	FLAME PHOTOMETER
05	GAS LIQUID CHROMATOGRAPH
06	CENTRIFUGE - SMALL
07	CENTRIFUGE - HIGH SPEED
08	AUTOCCLAVE
09	INCUBATOR
10	STERC MICROSCOPE
11	RESEARCH MICROSCOPE
12	ELECTRON MICROSCOPE
13	LAMINAR AIR FLOW CABINET
14	AMINO ACID ANALYSER
15	AUTOMALYSER
16	ELECTROPHORESIS
17	MUFFLE FURNACE
18	ROTARY EVAPORATORS
19	KAR FISHER APPARATUS
20	FREEZE DRYER/FREEZER
21	AUTOMATIC AUTOMATIC BEAD CALCULATOR
22	SOIL MOISTURE PROBE
23	SCINTILLATION COUNTER
24	PHYTOTHERM

APPENDIX IV

SOURCE DATA QUESTIONNAIRES

R E P U B L I C O F K E N Y A

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY (NCST)
P.O. BOX 30623, NAIROBI

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

FORM A: HOW TO COMPLETE THE FORM

Form A deals with Institution resources in general and should be completed by the Director/Officer in Charge of the institution. Please note that the term "institution" means the main research center and all substations under it.

The boxes printed on the forms are for computer coding. The coding system has been designed to facilitate information retrieval and updating in the future. Please do not write anything in these boxes.

Question 7: Please state the names of the substations, the land area (ha) they occupy and the agro-ecological zones in which they are situated. The six agro-ecological zones to be used in this study are:

1. Afro-alpine moorland and grassland.
2. Humid to dry-subhumid. Forests derived grassland and bushlands. Potential for forestry or intensive agriculture.
3. Dry Sub-humid to Semi-arid.
4. Semi-arid.
5. Arid
6. Very arid.

Question 8:

- 8.1 Please indicate the scientific staff under your institution by qualifications for fiscal years 1978/79 and 1979/80. The figures should include staff under aid projects.
- 8.2 The term "technologist" includes technical officers and similar cadres of technical support personnel who are not responsible for research projects. The data is required for the year 1979/80.
- 8.3 & 8.4: Data required for 1979/80.
- 8.5 This question attempts to identify the total annual operating costs of the institution for the ten year period 1970/71 to 1979/80. Please supply information on a separate sheet of paper. Where possible please indicate the Personal emoluments content of the cost.

Question 9: This question seeks information on the budgeting system. Specifically it attempts to relate budgetary requests by institutions, amounts supplied, the absorptive capacity of the institution and the balancing between the various expenditure subheads. Please supply the data for the 1979/80 Fiscal year.

Question 10: This question deals with funds provided by donors through special Technical Assistance Projects which are not included in the Institutional core budget under question 9. The data required is for 1979/80 Fiscal year.

FORM A: CODING INSTRUCTIONS

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
1	1-3 4-5 6 7-8	ID/CODE - Institution " - Year of Survey Blank Record Type	N N - N
2	9-23 24-33	Name of Director Qualifications utmost 5 No. (2 chs for each 1 No.)	A N
3 4 5	34-35 36 37-41	Province District Hectares	N N N
6	42-46 47	Hectares Ecozone	N N
7.1	48-52 53	Hectares Ecozone	N N
7.2	54-58 59	Hectares Ecozone	N N
7.3	60-64 65	Hectares Ecozone	N N

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
7.4	66-70 71	Hectares Ecozone	N N
7.5	72-76 77	Hectares Ecozone	N N
7.6	78-82 83	Hectares Ecozone	N N
8.1.1	1- 3 4- 5 6 7- 8 9-23	ID/CODE - Institution ID/CODE - Year of Survey Blank Record Type Man years for utmost 10 years (2 chs for each year)	N N - N N
8.1.2	29-48	Man years for utmost 10 years (2 chs for each year)	N
8.1.3	49-68	See 8.1.2 above	N
8.2.1 8.2.2 8.2.3	69-70 71-72 73-74	Senior Technologist - man years Technologist - man years Technician - man years	N N N
8.3.1 8.3.2 8.3.3	75-76 77-78 79-80	Executive - man years Clerical/Secretarial - man years Driver/Artisan - man years	N N N
8.4	81-83	Unskilled Labour - man years	N

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
8,5.1	1-3	ID/CODE - Institution	N
	4-5	ID/CODE - Year of Survey	N
	6	Blank	-
	7-8	Record Type	N
	9-28	Recurrent finance Kf for 10 years (2 chs for each year)	N
9.1	1-3	ID/CODE - Institution	N
	4-5	ID/CODE - Year of Survey	N
	6	Blank	-
	7-8	Record Type	N
	9-11	Budget item code	N
	12-13	Year of Budget (ending 19..)	N
	14-20	Requested Budget	N
	21-27	Approved Budget	N
	28-34	Actual expenditure	N
9.2	12-34	See 9.1 above	
9.3	12-34	" " "	
9.4	" "	" " "	
9.5	" "	" " "	
9.6	" "	" " "	
9.7	" "	" " "	
9.8	" "	" " "	
9.9	" "	" " "	
9.10	" "	" " "	
9.11	" "	" " "	
9.12	" "	" " "	

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
9.12	12-34	See 9.1 above	
9.13	12-34	See 9.1 above	
9.14	" "	" " "	
9.15	" "	" " "	
9.16	" "	" " "	
9.17	" "	" " "	
9.18	" "	" " "	
9.19	" "	" " "	
9.20	" "	" " "	
9.21	" "	" " "	
9.22	" "	" " "	
9.23	" "	" " "	
10.1	1-3	ID/CODE - Institution	N
	4-5	ID/CODE - Year of Survey	N
	6	Blank	-
	7-8	Record Type	N
	9-10	Year of Budget (ending 19..)	N
	11-17	Actual Expenditure	N
10.2	18-19	Year of Budget (ending 19..)	N
	20-26	Actual Expenditure	N

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY (NCST) P.O. BOX 30623, NAIROBI

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

						0	1
1	4	6	7				

9 24 26 28 30 32

34	36
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37

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42 47

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48					53
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54 

60					65
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66					71
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66					71
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7.4

81

[illegible]

20	31	33	35	37	39	41	43	45	47
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9. Budgeting System (19--/--)

9.2. House Allowances

9.3. Transport Operating Expenses

9.4. Travelling and Accommodation Expenses

9.5. Postal and Telecom. Expenses

9.6. Electricity, Water and Conservancy

9.7. Drugs, Vaccines and Pesticides

9.8. Purchase of Livestock

99. Farm Inputs

9.10- Training and Seminars

9.11. Food and Rations

9.12. Uniforms and Clothing

1	4	6	7	9	12	14	21	28	ACTUAL
			0	4	1	7	3		
			0	4	1	7	4		
			0	4	1	8	0		
			0	4	1	9	0		
			0	4	2	0	0		
			0	4	2	1	0		
			0	4	2	2	0		
			0	4	2	2	2		
			0	4	2	5	0		
			0	4	3	0	2		
			0	4	3	4	0		

9.13. Library Expenses
9.14. Stationery and Printing
9.15. Hiring, rents and rates
9.16. Miscellaneous and Other charges
9.17. Replacement of Transport
9.18. Additional Transport
9.19. Office Equipment
9.20. Plant and Equipment
9.21. Maintenance of Stations
9.22. National Cooperative Trials
9.23. Grants for commodity Research

10. Technical Assistance (Actual Expenditure 19—/—)

10.1. Personnel Costs

10.2. Operating Costs

Compiled by: Date:

1 4 6 7 9 11
0 5

18 20

R E P U B L I C O F K E N Y A

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY (NCST)
P.O. BOX 30623, NAIROBI

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

FORM B: HOW TO COMPLETE THE FORM

Form B is designed to identify all individual research projects whether short-term or long-term and the resources allocated to them. This form should be completed for each project by the principal investigator. For the purposes of this study, a project is defined as a series of experiments designed to provide information for a narrowly defined objective. Distinction should be made between a research project and a research programme. For example Maize Breeding is a Programme but breeding for resistance to maize streak is a Project. It is therefore possible that one scientist may be a principal investigator of several projects. A separate questionnaire should be completed for each of such projects.

The boxes printed on the forms are meant for computer coding. Please do not write anything in these boxes.

Question 2.3: The major categories are Crop, Livestock, Wildlife, Fisheries, Water, Forestry, Land Development and Climate.

Question 4: This question seeks to relate the research effort to the identified problems of production of various commodities.

- 4.1 State where possible the current level of production which the research project seeks to improve.
- 4.2 State where possible the level of production which could be achieved if the research effort was successful.
- 4.3 Looking at the commodity as a whole, rank in order of priority the factors listed in a scale 1-9 according to your own evaluation.

Question 6: For the purposes of this study, six agro-ecological zones are recognised as follows:

- 1. Afro-alpine moorland and grassland.
- 2. Humid to dry-subhumid. Forests derived grassland and bushlands. Potential for forestry or intensive agriculture.
- 3. Dry Sub-humid to Semi-arid.
- 4. Semi-arid
- 5. Arid
- 6. Very arid.

Question 7: This question seeks to establish the scientific personnel allocated to a given project. Research experience should be denoted by the number of years spent actively in research. Percent time means the proportion of working time devoted specifically to that project.

Question 8: Please provide an estimate of the total cost of each project identifying the local and external inputs.

8.2 Major equipment is defined as an item of Laboratory equipment whose replacement cost exceeds £1,000. Condition should be described as Excellent, Good, Fair, Poor or Not Operational. Percent time refers to proportion of time the equipment is used by the project in relation to use by other projects.

FORM B: CODING INSTRUCTIONS

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
1	1-3 4-5 6 7-8	ID/CODE - Institution ID/CODE - Year of Survey Blank Record Type	N N - N
2.2	9-11 12 13-15 16-17 18-19 20-23	Ref.No. - Institution - Category - Subject - Field of Research - Year of Survey - Blank	N N N N N -
3.2	24-26 27 28-30 31-32 33-34 35-38	Ref. No. - Institution - Category - Subject - Field of Research - Year of Survey - Serial Number	N N N N N N
4.1 4.2	39 40-45 46 47-52	Commodity Units Commodity Units	N N N N

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
4.3.1	53-54	Technical factors limiting production	N
4.3.2	55-56	Technical factors limiting production	N
4.3.3	57-58	"	"
4.3.4	59-60	"	"
4.3.5	61-62	"	"
4.3.6	63-64	"	"
4.3.7	65-66	"	"
4.3.8	67-68	"	"
4.3.9	69-70	"	"
5.1	71-73	Other institution cooperating	N
5.2	74-76	Other institution cooperating	N
5.3	77-79	"	"
5.4	80-82	"	"
5.5	83-85	"	"
5.6	86-88	"	"
6.1	1-3	ID/CODE - Institution	N
	4-5	ID/CODE - Year of Survey	N
	6	Blank	-
	7-8	Record Type	N
	9	Field of occurrence of existing sites	N

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
6.1.1	10 11-12 13 14	Site Province District Ecozone	N N " "
6.1.2	15-19	See 6.1.1 above	N
6.1.3	20-24	" " "	"
6.1.4	25-29	" " "	"
6.1.5	30-34	" " "	"
6.1.6	35-39	" " "	"
6.1.7	40-44	" " "	"
6.1.8	45-49	" " "	"
6.2	1-3 4-5 6 7-8 9	ID/CODE - Institution ID/CODE - Year of survey Blank Record Type Field of occurrence of proposed sites	N N - N N
6.2.1	10 11-12 13 14	Site Province District Ecozone	N " " "
6.2.2	15-19	See 6.2.1 above	N
6.2.3	20-24	" " "	N
6.2.4	25-29	" " "	"
6.2.5	30-34	" " "	"

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
6.2.6	35-39	See 6.2.1 above	N
6.2.7	40-44	" " "	"
6.2.8	45-49	" " "	"
7.1	1-3 4-5 6 7-8 9 10-11 12-26 27-36 37-38 39-40 41-43	ID/CODE - Institution ID/CODE - Year of survey Blank Record Type Field identifier Field of Research Name of Investigator Qualifications (2 chs.each) Research experience (yrs) Nationality % time	N N - N N N N N N N N
7.2	1-43	See 7.1 above	
7.3	1-3 4-5 6 7-8	ID/CODE - Institution ID/CODE - Year of survey Blank Record Type	N " - N
7.3.1	9-10 11-12 13-14 15-16 17-18	Staff in post Kenya Other Nationalities Vacant Posts Number Required	N " " " "
7.3.2	19-28	See 7.3.1 above	N
7.3.3.	29-38	" " "	"
7.4	39-48	" " "	"

ITEM	COL.	DESCRIPTION	ALPHA/ NUMERIC
8.1	1-3	ID/CODE - Institution	N
	4-5	ID/CODE - Year of survey	N
	6	Blank	-
	7-8	Record Type	N
8.1.1	9-13	Costs Kf	N
8.1.2	14-18	" "	"
8.1.3	19-23	" "	"
8.1.4	24-28	" "	"
8.2.1	1-3	ID/CODE - Institution	N
	4-5	ID/CODE - Year of survey	N
	6	Blank	-
	7-8	Record Type	N
8.2.1.1	9-10	Equipment description	N
	11-12	Quantity	N
	13-14	Year of Purchase	"
	15	Condition	"
	16-18	% use	"
	19-25	Replacement cost	"
8.2.1.2	26-42	See 8.2.1.1 above	N
8.2.1.3	43-59	" " "	"
8.2.1.4	60-76	" " "	"
8.2.1.5	77-93	" " "	"
8.2.2.1	94	Lab/Workshop office space	N
9.1	95-96	Date Project started (year)	N
9.2	97-98	Date Project completed (year)	N

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY (NCST), P.O. BOX 30623, NAIROBI

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH

1. Name of Institution

1	4	6	7	0	6
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2.1. Title

23. Category (Crop, Livestock, etc.)

301. Title

[illegible]

3.3. Subject Area being Studied

4.1. Current level of production of Commodity under research

[illegible]

4.2. Estimated potential production.

[illegible]

4.3.	Technical Factors limiting production	
4.3.1.	Diseases and Parasites	
4.3.2.	Insect Pests	
4.3.3.	Management	
4.3.4.	Improved Breeds	
4.3.5.	Soil	
4.3.6.	Weeds	
4.3.7.	Climate	
4.3.8.	Post Production (processing, Storage, Quality)	
4.3.9.	Economies	
4.4.	Major Findings of Past Research	
4.4.1.		
4.4.2.		
4.4.3.		
4.4.4.		
4.4.5.		

53	55	57	59	61	63	65	67	69

SITE NAME	PROVINCE	DISTRICT	ECOZONE

35 36 38 39

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40 41 43 44

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45 46 48 49

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1 4 6 7 9

						0 8
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10 11 13 14

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15 16 18 19

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20 21 23 24

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25 26 28 29

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30 31 33 34

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35 36 38 39

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6.2. Proposed

SITE NAME	PROVINCE	DISTRICT	ECOZONE

6.1.6.

6.1.7.

6.1.8.

6.2.1.

6.2.2.

6.2.3.

6.2.4.

6.2.5.

6.2.6.

SITE NAME	PROVINCE	DISTRICT	ECOZONE

60	41	43	44

45	46	47	48

7. Project Personnel

[illegible][illegible]

IN POST	KENYAN	OTHER NATIONAL- ITIES	VACANT POSTS	NUMBER REQUIRED

1	4	6	7	0

8.1.1. Personnel Costs - Local

8.1.2. Personnel Costs - Aid

8.1.3. Operating + Other Costs - Local

8.1.4. Operating + Other Costs - Aid

8.2.1. Main Equipment

DESCRIPTION	QUANTITY	YEAR OF PURCHASE	CONDITION	% USE	REPLACEMENT COST

8.2.1.3.

[illegible]

DESCRIPTION	QUANTITY	YEAR OF PURCHASE	CONDITION	% USE	REPLACEMENT COST

46 ☐

Duration of Project

Date started (w)

Date completed (yr).....

Results:

Expected

Achieved to-date

- 10.3. Status of Application of Results
10.4. Impact of Applied Results to date
.....

Compiled by: Date:

11. Who evaluates research projects ? (Yes = 1, No = 0)

- 11.1. Top management (employer)
- 11.2. Research Director
- 11.3. Programme Leaders
- 11.4. Standing Committees
- 11.5. Ad-hoc Committees
- 11.6. Others

46

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12. How often are research staff evaluated ? (Yes = 1, No = 0)

- 12.1. Annually
- 12.2. Every 2 years
- 12.3. Irregularly
- 12.4. No formal mechanism

52

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13. Who evaluates research staff ? (Yes = 1, No = 0)

- 13.1. Top Management (employer)
- 13.2. Research Director
- 13.3. Programme Leaders
- 13.4. Special Committees
- 13.5. Others (specify)

56

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14. How is the productive Scientist rewarded ? (Yes = 1, No = 0)

- 14.1. Accelerated Promotion
- 14.2. Special awards (bonus)
- 14.3. Letter of Commendation
- 14.4. No action taken

61
□ □ □ □

15. How is the unproductive Scientist dealt with ? (Yes = 1, No = 0)

- 15.1. No Promotion
- 15.2. Demoted
- 15.3. Transferred
- 15.4. Dismissed
- 15.5. No action taken

65
□ □ □ □

16. How are technical staff recruited, deployed and trained ? (Yes = 1, No = 0)

- 16.1. Only qualified staff recruited, no formal training
- 16.2. Trained on the job at employer's expense
- 16.3. Awards: fellowships prior to employment

70
□ □ □

Compiled by: Date:

APPENDIX V

DATA AMENDMENT SHEET

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY												
RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH												
DATA AMENDMENT SHEET												
FOR RECORD TYPES 04 TO 12 ONLY												
PROGRAM NO. PROJECT NUMBER												
REC. NO.	1	2	3	4	5	6	7	8	9	10	11	12
DATE	12	22	22	22	22	22	22	22	22	22	22	22
TIME	01	12	23	45	67	89	01	12	23	45	67	89
VALUE	1	2	3	4	5	6	7	8	9	10	11	12
FOR ALL RECORD TYPES	1	2	3	4	5	6	7	8	9	10	11	12
PROGRAM NO.	1	2	3	4	5	6	7	8	9	10	11	12
PROJECT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12

APPENDIX VI

LIST OF INSTITUTIONS

001 VCST
002 ASARC
003 VSARC
004 ISARC
005 MSARC
006
007
008
009
010 KARI GENERAL
011 KETRI GENERAL
012 KMFRI GENERAL
013 KIRDI GENERAL
014 KMRI GENERAL
015 KWRI GENERAL
016 KWRI GENERAL
017 EGERTON COLLEGE
018
019
020 MINISTRY OF AGRICULTURE
021 MINISTRY OF LIVESTOCK DEVELOPMENT
022 MINISTRY OF HEALTH
023 MINISTRY OF ENERGY
024 MINISTRY OF INDUSTRY
025 MINISTRY OF EDUCATION
026
027
028
029
030 KARI-ARD
031 KARI-VRD
032 KARI-FRD
033 KARI-APD
034 KETRI
035 KMFRI
036 KIRDI
037 KMRI
038 KWRI
039 KWRI
040 CRF
041 TRF
042 ILRAD
043 ICRAF
044 ICIPE
045 JNEP
046 IDRC
047 VIB
048 FACULTY OF AGRICULTURE
049 FACULTY OF SCIENCE
050 IDS
051 FACULTY OF VET MEDICINE
052 SUGAR COMPANIES
053
054
055 OTHER UNIVERSITY FACULTIES
056
057

APPENDIX IX

Category of Programmes

<u>CODE</u>	<u>DESCRIPTION</u>
1	Crop
2	Livestock
3	Wildlife
4	Fisheries
5	Water
6	Forestry
7	Land Development
8	Climate
9	Others.

APPENDIX X
SUBJECT AREAS

001 BIOSPHERE IN GENERAL
002 SOIL IN GENERAL
003 SOIL COMPOSITION-GENERAL
004 SOIL COMPOSITION-INORGANIC
005 SOIL COMPOSITION-ORGANIC
006 SOIL COMPOSITION-SOIL AIR, SOIL WATER
007 SOIL COMPOSITION-OTHER
008 SOIL STRUCTURE
009 BIO-COMMUNITIES IN THE SOIL
010 OTHER SUBJECTS RELATED TO SOIL
011 WATER IN GENERAL
012 WATER COMPOSITION
013 BIO-COMMUNITIES IN THE WATER
014 OTHER SUBJECTS RELATED TO WATER
015 AIR AND CLIMATE IN GENERAL
016 EXTERNAL CLIMATE
017 INTERNAL CLIMATE
018 OTHER SUBJECTS RELATED TO AIR AND CLIMATE
019 RANGE, UNCULTIVATED LAND AND NATURAL VEGETATION IN GENERAL
020 NATURAL SHORT VEGETATION AND WEEDS
021 OTHER SUBJECTS RELATED TO RANGE, UNCULTIVATED LAND & VEG
022 WATER AND RIVERBASINS IN GENERAL
023 SEES, LAKES, RIVERS, POOLS IN GENERAL
024 LAKES, RIVERS, POOLS AND RELATED FRESH WATER ECOSYSTEM
025 DITCHES AND CANALS
026 OTHER SUBJECTS RELATED TO WATERSHEDS AND RIVER BASINS
027 PARKS GARDENS, URBAN GREENSPACES, PLANTATIONS
028 ARBORETA AND BOTANICAL GARDENS
029 OTHER SUBJECTS AREAS RELATED TO BIOSPHERE & RECR
030 PLANTS AND ANIMALS IN GENERAL
031 PLANTS AND PARTS OF PLANTS IN GENERAL
032 PLANT COMMUNITIES AS ECOLOGICAL SYSTEMS
033 ANIMALS AND PARTS OF THEIR BODIES
034 ANIMALS COMMUNITIES AS ECOLOGICAL SYSTEMS
035 ANIMALS AND PLANT COMMUNITIES AS ECOLOGICAL SYSTEMS
036 ANIMAL DISEASES
037 OTHER SUBJECTS RELATED TO PLANTS AND ANIMALS IN GENERAL
038 CROPS IN GENERAL
039 CEREALS IN GENERAL
040 BARLEY
041 MAIZE
042 OATS
043 RICE
044 RYE
045 SORGHUM & MILLET
046 WHEAT
047 OTHER CEREALS
048 FIBRE PLANTS AND OIL CROPS IN GENERAL
049 FLEX
050 RAPE
051 SOYBEAN
052 SUNFLOWER
053 OTHER FIBRE PLANTS AND OIL CROPS
054 CASSAVA AND STARCH PRODUCING PLANTS IN GENERAL
055 POTATOES
056 SUGARCANE AND OTHER SUGAR CROPS
057 OTHER STARCH PRODUCING PLANTS
058 GRASSES AND FORAGE CROPS IN GENERAL
059 GRASSES
060 PASTURES, GRASSLAND
061 LEGUMES IN GENERAL
062 GRASSLAND LEGUMES
063 OTHER LEGUMES
064 CEREALS USED FOR FORAGE

065 OTHER FORAGE CROPS
 066 VEGETABLES IN GENERAL
 067 ROOT TUBER AND BULB VEGETABLES
 068 GREENS AND LEAFY VEGETABLES
 069 VEGETABLE FRUITS IN GENERAL
 070 LEGUMINOUS VEGETABLES
 071 TOMATOES
 072 CUCUMBERS
 073 OTHER VEGETABLE FRUITS
 074 MUSHROOMS AND OTHER EDIBLE FUNGI
 075 OTHER VEGETABLES
 076 FRUITS IN GENERAL
 077 TOP FRUIT IN GENERAL
 078 APPLE
 079 PEAR
 080 OTHER TOP FRUIT
 081 SOFT FRUIT (BERRIES AND CANE FRUITS)
 082 CITRUS FRUIT
 083 TROPICAL AND SUB-TROPICAL FRUITS
 084 GRAPES
 085 EDIBLE NUT FRUITS
 086 OTHER FRUITS
 087 ORNAMENTALS AND ORNAMENTAL PRODUCTS IN GENERAL
 088 BULBS
 089 FLOWERS AND POT PLANTS
 090 ORNAMENTAL SHRUBS
 091 OTHER ORNAMENTAL LAND ORNAMENTAL PRODUCTS
 092 FOREST IN GENERAL
 093 PINE FORESTS IN GENERAL
 094 OTHER PINE FORESTS
 095 LEAFWOODS IN GENERAL
 096 OTHER LEAFWOODS
 097 OTHER FORESTS
 098 STIMULANT CROPS
 099 SPICE AND SEASONING PLANTS OF WARM CLIMATES
 100 SPICE AND SEASONING PLANTS OF TEMPERATE CLIMATES
 101 PERFUME PLANTS
 102 RUBBER, GUM, WAX AND RESIN PLANTS
 103 TAN AND DYE PLANTS
 104 DRUGS AND MEDICINE PLANTS
 105 INSECTICIDE PLANTS
 106 OTHER CROPS
 107 DOMESTIC ANIMALS IN GENERAL
 108 INSECT PESTS
 109 BIRD PESTS
 110 PLANT DISEASES-FUNGUS
 111 PLANT DISEASES - VIROLOGY
 112 PLANT DISEASES - PATHOLOGY
 113 DAIRY CATTLE
 114 SHEEP
 115 GOATS
 116 BEEF CATTLE
 117 COTTON
 118 FARMING SYSTEM ECONOMICS
 119 GROUNDNUTS
 120 CASTOR
 121 CROP RESIDUALS
 122 DRAUGHT ANIMALS
 123 ECONOMICS
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APPENDIX XI

COMMODITY UNDER RESEARCH

<u>COMMODITY</u>	<u>CODE</u>	<u>UNITS</u>
Crops	1	Metric tonnes/annum
	2	Kg/ha
Animals	3	No. of heads
	4	No. of heads/hectare
Water	5	Cubic metres
Forestry	6	Cubic metres/ha
	7	Hectares
Land Development	8	Hectares

APPENDIX XII

Technical Factors Limiting Production

<u>CODE</u>	<u>DESCRIPTION</u>
01	Diseases & Parasites
02	Pests
03	Management
04	Improved Seed/Breeds
05	Soil fertility
06	Weeds
07	Climate
08	Post Production
09	Marketing Economics

FIELDS OF RESEARCH

- 01 SOIL SCIENCE
- 02 LAND AND WATER MANAGEMENT
- 03 DRAINAGE, IRRIGATION AND WATER SUPPLY
- 04 SOIL IMPROVEMENT
- 05 SURVEYING
- 06 NATURE CONSERVATION
- 07 PLANNING LAND USE
- 08 LAND CONSOLIDATION AND LAND LAYOUT
- 09 PLANT PRODUCTION GENERAL AND CROP HUSBANDRY
- 10 PLANT NUTRITION AND FERTILIZATION
- 11 PLANT BREEDING
- 12 PLANT PROTECTING
- 13 PESTS OF PLANTS AND PEST CONTROL
- 14 PLANT DISEASE AND DISEASE CONTROL
- 15 WEEDS AND WEED CONTROL
- 16 MISCELLANEOUS PLANT DISORDERS
- 17 ANIMAL MANAGEMENT GENERAL AND ANIMAL HUSBANDRY
- 18 ANIMAL NUTRITION
- 19 ANIMAL BREEDING
- 20 ANIMAL DISEASE, VETERINARY MEDICINE
- 21 ENGINEERING - EQUIPMENT
- 22 ENGINEERING - BUILDINGS
- 23 CIVIL ENGINEERING
- 24 TECHNOLOGY
- 25 HARVESTING
- 26 STORAGE AND CONSERVATION
- 27 PROCESSING
- 28 TRANSPORT AND HANDLING
- 29 WORK MANAGEMENT
- 30 FARM MANAGEMENT
- 31 MARKETING
- 32 ECONOMIC POLICY
- 33 SOCIAL POLICY
- 34 AGRICULTURAL SOCIOLOGY AND WELFARE
- 35 DIDACTICS OF EXTENSION AND ADVISORY SERVICE
- 36 DIDACTICS OF EDUCATION AND TRAINING
- 37 DOMESTIC SCIENCE
- 38 HUMAN NUTRITION AND FOOD RESEARCH
- 39 FOOD COMPOSITION
- 40 PHYSIOLOGY OF NUTRITION
- 41 FEEDING
- 42 PUBLIC HEALTH AND MEDICINE
- 43 PUBLIC HEALTH ENGINEERING
- 44 MEDICINE
- 45 DOCUMENTATION, PUBLICATION AND INFORMATION
- 46 GENERAL RESEARCH METHODOLOGY
- 47 MATHEMATICS
- 48 CHEMICAL TECHNIQUES
- 49 PHYSICAL TECHNIQUES
- 50 BIOLOGICAL TECHNIQUES
- 51 OTHER METHODS OR TECHNIQUES
- 52 ROUTINE RESEARCH AND SERVICES
- 53 RESEARCH WHICH CANNOT BE CLASSIFIED IN THE FIELDS MENTIONED ABOVE.
- 54 VARIETY ADAPTATION TRIALS
- 55 CHEMISTRY - QUALITY
- 56 FARM ECONOMICS
- /*
- /&
- * 11 EJJ

APPENDIX XIV

Qualifications

<u>CODE</u>
01
02
03
04
05
06
07
08
09

<u>DESCRIPTION</u>
BSc
BSCA
BA
B Eng.
B Com.
BVM
MSc
MA
PhD

APPENDIX XV

NATIONALITIES

<u>CODE</u>	<u>NAME</u>
01	Kenya - Male
02	" - Female
03	Uganda - Male
04	" - Female
05	Tanzania - Male
06	" - Female
07	U.K. - Male
08	" Female
09	India - Male
10	" Female
11	Germany - Male
12	" - Female
13	Netherlands - Male
14	" - Female
15	U.S.A. - Male
16	" - Female
17	Australia - Male
18	" - Female
19	Canada - Male
20	" - Female
88	Other African Countries - Male
89	" " - Female
98	Other Countries - Male
99	" " - Female

APPENDIX XVI

Designations

<u>CODE</u>	<u>DESCRIPTION</u>
1	Director-General/Head of System
2	Director/Officer in Charge of Institution
3	Senior Research Officer/Head of Section
4	Research Officer
5	Senior Technologist/Technical Officer
6	Technologist (Technical Officer)
7	Technician (Tech. Assistant)

APPENDIX XVII
MAJOR SCIENTIFIC EQUIPMENT

01 SPECTROPHOTOMETER
02 ATOMIC ABSORPTION SPECTROPHOTOMETER
03 COLORIMETER
04 FLAME PHOTOMETER
05 GAS LIQUID CHROMATOGRAPH
06 CENTRIFUGE - SMALL
07 CENTRIFUGE - HIGH SPEED
08 AUTOCLAVE
09 INCUBATOR
10 STEREO MICROSCOPE
11 RESEARCH MICROSCOPE
12 ELECTRON MICROSCOPE
13 LAMINAR AIR FLOW CABINET
14 AMINO ACID ANALYSER
15 AUTOMATISER
16 ELECTROPHORESIS
17 MUFFLE FURNACE
18 ROTARY EVAPORATORS
19 KARL FISHER APPARATUS
20 FREEZE DRYER/FREEZER
21 AUTOMATIC ADHESIVE BEAD CALORIMETER
22 SOIL MOISTURE PROBE
23 SCINTILLATION COUNTER
24 PHYTOTRON
25 COLD ROOM
26 REFRACTOMETER
27 X-RAY DIFFRACTOMETER
28 MICROSCOPE
29 HOMOGENIZER
30 INFRARED SPECTROPHOTOMETER
31 POTTER SPRAY TOWER
32 PRESSURE PLATE APPARATUS
33 DESK-TOP COMPUTER
34 COMPUTER - MAGNETIC DISC/TAPE AND FULL SIZE PRINTER
35 LYSIMETERS
36 DARKROOM AND ASSOCIATED PHOTOGRAPHIC EQUIPMENT
37 JEFCO WET DISINTEGRATOR
38 SPECIALISED OVEN
39 HOT WATER TREATMENT PLANT
40 POLARIMETER
41 COTTON GIN DOUBLE ROLLER
42 COTTON GIN SINGLE ROLLER
43 WEIGHBRIDGE/HEAVY DUTY WEIGHING MACHINE
44 KARL ROA MILL.
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APPENDIX XVIII

CONDITION OF SCIENTIFIC EQUIPMENT

<u>CODE</u>	<u>CONDITION</u>
1	Excellent
2	Good
3	Fair
4	Poor
5	Not operational

APPENDIX XIX
PROGRAMME IDENTIFICATION

075104109810004 GRAIN LEGUME IMPROVEMENT
 075106309810004 GRAIN LEGUME PROJECT
 075104109810003 AGRONOMY
 075105809810002 FORAGE CROPS AGRONOMY
 075104111810001 MAIZE IMPROVEMENT
 075104109810001 MAIZE IMPROVEMENT
 077103109810006 SERICULTURE
 077103163810006 SERICULTURE
 077106313810005 CRDP PROTECTION
 077106609810004 VEGETABLE IMPROVEMENT
 077106609810004 VEGETABLE IMPROVEMENT
 077106611810004 VEGETABLE IMPROVEMENT
 077106838810004 NUTRITIVE VALUE OF INDIGENOUS VEGETABLES
 077105438810003 CASSAVA RESEARCH DEVELOPMENT
 077106311810002 SCREENING BEANS FOR RESISTANCE TO DISEASES
 077106111810002 GRAIN LEGUME IMPROVEMENT
 077106109810002 GRAIN LEGUME IMPROVEMENT
 077106109810002 GRAIN LEGUME IMPROVEMENT
 077106114810002 GRAIN LEGUME IMPROVEMENT
 077106111810002 GRAIN LEGUME IMPROVEMENT
 077107609810001 FRUIT TREES IMPROVEMENT
 077107609810001 FRUIT IMPROVEMENT
 077107611810001 PLANT INTRODUCTION & TISSUE CULTURE
 077108609810001 SMALL FRUITS
 077107609810001 SMALL FRUITS
 077108309810001 AVOCADO IMPROVEMENT
 077108209810001 CITRUS IMPROVEMENT
 077106638810001 HORTICULTURE
 077107651810001 PROPAGATION
 077810765810001 HORTICULTURE RESEARCH & DEVELOPMENT
 069211318810002 DAIRY CATTLE RESEARCH
 069211318810002 DAIRY CATTLE RESEARCH
 069211430810002 MANAGEMENT OF SHEEP UNDER HIGH ALTITUDE CONDITIONS
 069211519810001 BEEF CATTLE IMPROVEMENT
 069211519810001 BEEF CATTLE IMPROVEMENT
 069211519810001 BEEF CATTLE BREEDING & MANAGEMENT
 069211519810001 IDENTIFICATION OF SHEEP BREE(S) SUITABILITY TO VARIOUS ECOLOGIC
 069211519810001 GENETIC IMPROVEMENT OF DUAL PURPOSE GOATS FOR INTENSIVE SMALL H
 069211519810001 GENETIC IMPROVEMENT OF DAIRY GOATS FOR INTENSIVE HOLDER SYSTEMS
 069211519810001 LIVESTOCK BREEDING
 069211319810001 LIVESTOCK BREEDING
 066107657810003 HORTICULTURE
 066107658810003 HORTICULTURE
 066106658810003 HORTICULTURE
 066106657810003 HORTICULTURE
 066106658810003 HORTICULTURE
 066110511810002 PYRETHRUM BREEDING
 066110511810002 PYRETHRUM BREEDING
 066110509810001 AGRONOMY (PYRETHRUM)
 066110509810001 AGRONOMY (PYRETHRUM)
 066110509810001 AGRONOMY - PYRETHRUM
 066110509810001 AGRONOMY - PYRETHRUM
 041109811810004 PLANT IMPROVEMENT - BOTANY
 041109859810004 CRDP IMPROVEMENT
 041109857810004 PLANT IMPROVEMENT - BOTANY
 041109811810004 PLANT IMPROVEMENT - BOTANY
 041109811810004 PLANT IMPROVEMENT - BOTANY
 041109855810001 TEA QUALITY
 041109855810001 TEA QUALITY
 041109860810003 CRDP ENVIRONMENT
 041109801810003 CRDP ENVIRONMENT
 041109860810003 CRDP ENVIRONMENT
 041109860810003 CRDP ENVIRONMENT STUDIES
 041109810810002 SOIL FERTILITY IN TEA PRODUCTION

041109810810002 SOIL FERTILITY IN TEA PRODUCTION
 082108509810003 CASHENUT RESEARCH
 082106009810002 PASTURE RESEARCH
 082104113810001 STEM BORER CONTROL
 073111856810002 POTATO AGRONOMY
 073111856810002 POTATO RESEARCH
 073105509810001 POTATO AGRONOMY
 073105509810001 POTATO AGRONOMY
 068104011810001 SEED QUALITY CONTROL
 068106511810001 SEED QUALITY CONTROL
 068105211810001 SEED QUALITY CONTROL
 068104111810001 SEED QUALITY CONTROL
 068105511810001 SEED QUALITY CONTROL
 068106311810001 SEED QUALITY CONTROL
 074100210810005 SOIL FERTILITY
 074110826810001 CROP PROTECTION IN STORAGE
 074110813810001 PESTICIDE RESEARCH
 074110813810001 CROP PROTECTION
 074110813810002 PESTICIDE RESEARCH
 074100210810003 SOIL FERTILITY
 074100210810003 SOIL SURVEY
 074100215810005 SOIL FERTILITY
 074100210810003 SOIL FERTILITY
 074100210810003 SOIL FERTILITY
 074100210810003 SOIL FERTILITY
 074106310810003 AGRONOMY
 074111214810004 CROP PROTECTION
 074111214810004 CROP PROTECTION (PATHOLOGY)
 074105514810004 CROP PROTECTION (PATHOLOGY)
 071104111810002 MAIZE BREEDING
 071211318810001 LIVESTOCK MANAGEMENT
 071211518810001 SHEEP AND GOAT
 074211519810002 LIVESTOCK IMPROVEMENT
 074211619810002 LIVESTOCK IMPROVEMENT
 074211517810002 LIVESTOCK IMPROVEMENT
 074303418810003 ANIMAL ECOLOGY
 074201930810004 RANGE MANAGEMENT
 074203517781001 RANGE MANAGEMENT
 074201902810001 RANGE MANAGEMENT
 074201902810001 RANGE & LIVESTOCK RESEARCH
 074202118810001 RANGE MANAGEMENT
 074201909810001 RANGE MANAGEMENT
 062111912810001 CROP PROTECTION IN GROUNDNUT
 062111809810002 GROUNDNUT AGRONOMY
 062104509810002 FINGER MILLET AGRONOMY
 062104509810002 SORGHUM AND MILLETS DEVELOPMENT
 062104511810003 SORGHUM AND MILLETS DEVELOPMENT
 062911856810004 FARM SYSTEM ECONOMICS
 074104314810002 RAIN FED RICE
 074105209810001 SUNFLOWERS AGRONOMY
 074105211810001 SUNFLOWERS BREEDING
 074111713810003 COTTON ENTOMOLOGY
 074111709810003 COTTON AGRONOMY
 074111711810003 COTTON BREEDING
 074111710810003 COTTON AGRONOMY
 074111710810003 COTTON AGRONOMY
 063111709810003 COTTON AGRONOMY
 063111709810003 COTTON AGRONOMY
 063111709810003 COTTON AGRONOMY
 063111709810003 COTTON AGRONOMY
 063111713810002 PEST MANAGEMENT IN COTTON
 063111713810002 PEST MANAGEMENT IN COTTON
 063111713810002 PEST MANAGEMENT IN COTTON
 063111713810002 PEST MANAGEMENT IN COTTON

063111711810301	COTTON BREEDING
063111711810001	COTTON BREEDING
063111711810301	COTTON BREEDING
063111711810301	COTTON BREEDING
064105509810303	SUGARCANE AGRONOMY
064105512810302	CROP PROTECTION IN SUGARCANE
064105554810301	SUGARCANE BREEDING
065108310810002	HORTICULTURE RESEARCH
065108312810302	HORTICULTURE CROPS RESEARCH
065106709810302	HORTICULTURE RESEARCH
065108309810302	HORTICULTURE RESEARCH
065105209610301	SUNFLOWER AGRONOMY
065105509810301	SWEET POTATO AGRONOMY
065105509810301	SWEET POTATO AGRONOMY
065105509810301	SWEET POTATO AGRONOMY
065105509810301	SWEET POTATO AGRONOMY
065111309810301	GROUNDWUT AGRONOMY
065104109810301	MAIZE AGRONOMY
065104109810301	MAIZE AGRONOMY
065104109810301	MAIZE AGRONOMY
065104109810301	MAIZE AGRONOMY
065105109810301	SOYBEAN AGRONOMY
065111909810301	GROUNDWUT AGRONOMY
065104509810301	SORGHUM AGRONOMY
065104509810301	MILLET AGRONOMY
065104109810301	MAIZE AGRONOMY
065104109810301	MAIZE AGRONOMY
061105911810302	NAPIER SEEDLING STAGE EVALUATION
061105911810302	STAR GRASS BREEDING
061105911810302	NAPIER GRASS BREEDING
061105954810302	FORAGE PRODUCTION
061105941810001	FODDER PRODUCTION
061105918810301	EVALUATION OF PASTURE GRASS
061104109810303	MAIZE AGRONOMY
061104110810303	MAIZE AGRONOMY
061104110810303	MAIZE AGRONOMY
061104109810303	MAIZE AGRONOMY
061104109810303	MAIZE AGRONOMY
061104113810305	MAIZE AGRONOMY
061104109810303	MAIZE AGRONOMY
061104109810303	MAIZE AGRONOMY
061104109810303	MAIZE AGRONOMY
061154110810301	MAIZE AGRONOMY
061104111810301	MAIZE BREEDING
061104111810001	MAIZE BREEDING
061104111810301	MAIZE BREEDING
061104111810301	MAIZE BREEDING
061104111810301	MAIZE BREEDING
061104111810301	MAIZE BREEDING
067103449810303	GRAIN CHEMISTRY TECHNOLOGY
067105209810301	OLD SEED AGRONOMY
067110813810304	CROP PROTECTION
067105209810301	OLD SEED AGRONOMY
067104509810301	WHEAT AGRONOMY
067104511810002	WHEAT BREEDING
067111214810304	PLANT PROTECTION
067105311810302	OLD SEED CROP BREEDING
067104011810006	BARLEY BREEDING
067104011810302	BARLEY BREEDING
067104211810302	DAT BREEDING
067104511810302	DURUM BREEDING
067104711810302	TRITICAL BREEDING
067105009810301	OLD SEED AGRONOMY
061211318810302	ANIMAL PRODUCTION
061211518810302	ANIMAL PRODUCTION
061211318810315	ANIMAL PRODUCTION
061210718810002	ANIMAL PRODUCTION
061106009810302	FORAGE AGRONOMY

061106010810002 FORAGE AGRONOMY
 061106009810002 FORAGE AGRONOMY
 061106009810002 FORAGE AGRONOMY
 061106009810002 FORAGE AGRONOMY
 061106009810002 FORAGE AGRONOMY
 061106113810002 FORAGE AGRONOMY
 155104355810001 SOCIO-ECONOMIC RESEARCH
 055105632810001 SOCIO-ECONOMIC RESEARCH
 055912332810001 SOCIO-ECONOMIC RESEARCH
 055911831810001 SOCIO-ECONOMIC RESEARCH
 051211320810002 PESTICIDE RESIDUES IN FOOD
 051203620810002 PESTICIDE RESIDUES IN FOOD
 051211620810003 TREATMENT OF CATTLE DISEASES
 051203620810003 LIVESTOCK DISEASES
 051203620810003 LIVESTOCK DISEASES TO PARASITS
 050103855810001 AGRICULTURAL DEVELOPMENT / RJRAL DEVELOPMENT
 050900232810004 SOCIAL SCIENCE RESEARCH
 050900232810001 SOCIAL SCIENCE RESEARCH
 050900232810001 SOCIAL SCIENCE RESEARCH
 049108511810003 CASHEW RESEARCH
 048210718810004 POULTRY RESEARCH
 048210718810004 ANIMAL PRODUCTION
 048200701810001 MICROBIOLOGY
 048103815810003 WEED SCIENCE
 048103815810003 CROP PROTECTION
 048106311810001 COW PEA IMPROVEMENT
 048111214810003 CROP PROTECTION
 048105514810003 CROP PROTECTION
 048111214810003 CROP PROTECTION
 048106101810001 SOIL FERTILITY
 048110611810001 PLANT BREEDING
 030211619810016 ANIMAL PRODUCTION
 030205413810015 ANIMAL PRODUCTION
 030205813810016 ANIMAL PRODUCTION
 030912021810014 AGRICULTURE ENGINEERING
 030100202810014 AGRICULTURE ENGINEERING
 030106312810013 CROP PROTECTION
 030108012810013 CROP PROTECTION
 030107114810013 CROP PROTECTION
 030103814810013 CROP PROTECTION
 030103814810013 CROP PROTECTION
 030110813810013 CROP PROTECTION
 030105512810013 CROP PROTECTION
 030100904810012 SOIL FERTILITY
 030100310810012 DRYLAND CROPPING SYSTEMS RESEARCH
 030103802810012 DRYLAND CROPPING SYSTEMS RESEARCH
 030911856810040 DRYLAND CROPPING SYSTEMS RESEARCH
 030100202810012 DRYLAND CROPPING SYSTEMS RESEARCH
 030103803810012 DRYLAND CROPPING SYSTEMS RESEARCH
 030111856810012 DRYLAND CROPPING SYSTEMS RESEARCH
 030103814810001 IRYLAND CROPPING SYSTEMS RESEARCH
 030103809810012 IRYLAND CROPPING SYSTEMS RESEARCH
 032609314810015 FOREST PATHOLOGY
 032609214810015 FOREST PROTECTION
 083211520810011 BACTENJLOGY PROGRAMME
 083210720810011 BACTENJLOGY PROGRAMME
 083210720810011 BACTENJLOGY PROGRAMME
 083210720810011 BACTENJLOGY PROGRAMME
 083210720610011 BACTENJLOGY PROGRAMME
 083210720810011 BACTENJLOGY PROGRAMME
 083211520810011 BACTENJLOGY PROGRAMME
 083211520810011 BACTENJLOGY PROGRAMME
 070211619810010 BEEF BULLS PERFORMANCE
 070211641810009 ANIMAL PRODUCTION (BEEF)
 070206009810008 PASTURE SEED PRODUCTION
 070205409810008 PASTURE FORAGE RESEARCH

070206009810008 PASTURE FORAGE RESEARCH
 070104511810007 SORGHUM BREEDING
 070211518810006 ANIMAL NUTRITION
 070211518810006 ANIMAL NUTRITION
 040210609810011 COFFEE AGRONOMY
 040210614810003 CROP PROTECTION-COFFEE
 040210610810005 CHEMISTRY NUTRITION OF COFFEE
 040210610810005 FERTILIZER PLACEMENT STUDIES
 040210613810004 CROP PROTECTION IN COFFEE - ENTOMOLOGY
 040210610810004 CROP PROTECTION IN COFFEE - ENTOMOLOGY
 040210610810004 CROP PROTECTION IN COFFEE - ENTOMOLOGY
 040210610810004 CROP PROTECTION IN COFFEE - ENTOMOLOGY
 040210614810003 CROP PROTECTION IN COFFEE - ENTOMOLOGY
 040210614810003 CROP PROTECTION IN COFFEE - ENTOMOLOGY
 040210655810002 SOCIAL & ECONOMIC STUDIES ON COFFEE PRODUCTION
 040210655810002 SOCIAL & ECONOMIC STUDIES ON COFFEE PRODUCTION
 040210609810001 COFFEE AGRONOMY
 040210609810001 COFFEE AGRONOMY
 040210609810001 COFFEE AGRONOMY
 040210609810001 COFFEE AGRONOMY
 040109809810005 COFFEE PHYSIOLOGY
 040109802810005 COFFEE PHYSIOLOGY
 040109809810005 COFFEE PHYSIOLOGY
 040109803810005 COFFEE PHYSIOLOGY
 040109809810005 COFFEE PHYSIOLOGY
 040109814810004 COFFEE PROTECTION - PATHOLOGY
 040109814810004 COFFEE CROP PROTECTION / PATHOLOGY
 040109814810004 COFFEE CROP PROTECTION / PATHOLOGY
 040109813810004 COFFEE CROP PROTECTION / ENTOMOLOGY
 040109812810004 COFFEE CROP PROTECTION / PATHOLOGY
 040109814810004 COFFEE CROP PROTECTION / PATHOLOGY
 040109811810003 COFFEE BREEDING
 040109811810003 COFFEE BREEDING
 040109811810003 COFFEE BREEDING
 040109811810003 COFFEE BREEDING
 040109811810003 COFFEE BREEDING
 040109811810003 COFFEE BREEDING
 040109810810001 MISCELLANEOUS INVESTIGATIONS
 078104511810002 SORGHUM AND FINGER MILLET DEVELOPMENT
 078103861810001 DRYLAND FARMING RESEARCH
 078106111810001 DRYLAND FARMING RESEARCH
 078105411810001 DRYLAND FARMING RESEARCH
 078104811810001 DRYLAND FARMING RESEARCH & DEVELOPMENT
 078106111810001 DRYLAND FARMING
 078106111810001 DRYLAND FARMING RESEARCH & DEVELOPMENT
 078106111810001 DRYLAND FARMING RESEARCH & DEVELOPMENT
 078112011810001 DRYLAND FARMING RESEARCH & DEVELOPMENT
 078103825810001 CROP PROTECTION
 078103813810001 CROP PROTECTION
 078911861810001 DRYLAND RESEARCH
 078911581810001 FARMING SYSTEMS ECONOMICS RESEARCH
 078205817810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078206517810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078206017810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078212117810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078206517810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078206511810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078206017810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 078212217810001 DRYLAND FARMING RESEARCH AND DEVELOPMENT
 032609214810001 FOREST PATHOLOGY
 032609313810001 FOREST PROTECTION
 032603205810002 FOREST ECOLOGY
 032609211810003 TREE BREEDING
 032609211810003 TREE BREEDING
 032609311810003 TREE BREEDING
 099211753810003 PESTICIDE RESIDUES IN ENVIRONMENT

099402353810003 PESTICIDE RESIDUES IN ENVIRONMENT
099203826810004 CROP DRYING AND STORAGE
099208511810002 HORTICULTURE
099211214810001 MYCOLOGY AND PLANT PATHOLOGY
099211214810001 CROP PROTECTION
099210912810001 CROP PROTECTION
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APPENDIX XX
PROJECT IDENTIFICATION

075104163810002 HUSBANDRY PRACTICES
 075106309810001 AGRONOMY
 075104163810001 MAIZE & BEANS INTERCROPPING
 075105809810001 FODDER CROPS AGRONOMY
 075104111810002 MEDIUM MATURITY MAIZE VARIETIES (TRIALS)
 075104109810001 MAIZE AGRONOMY
 077203363810003 REELING (SPINNING)
 077203363810002 SILKWORM REERING
 077103109810001 MULBERRY AGRONOMY
 077106313810001 PEST CONTROL
 077106709810004 VEGETABLE AGRONOMY
 077106809810003 VEGETABLE AGRONOMY
 077106511810002 VEGETABLE SEED PRODUCTION
 077106838810001 DETERMINATION OF C AND VIT A IN INDEGENOUS VEGETABLES
 077105438810001 QUALITY ASPECTS OF CASSAVA
 077106311810006 BREEDING BEANS FOR RESISTANCE TO HALO BLIGHT
 077106111810005 BEAN AGRONOMY
 077106101810004 BEAN AGRONOMY
 077106155810003 BEAN AGRONOMY
 077106114810002 BEAN PATHOLOGY
 077106111810001 BEAN BREEDING SECTION
 077108309810010 BANANA AGRONOMY
 077108209810009 CITRUS AGRONOMY
 077107511810008 FRUIT INTRODUCTION AND TISSUE CULTURE
 077108609810007 PASSION FRUIT DEVELOPMENT
 077108409810006 GRAPE DEVELOPMENT
 077108309810005 AVOCADO AGRONOMY
 077108210810004 AGRONOMY
 077106538810003 CHANGE IN HORTICULTURAL CROPS IN STORAGE
 077107551810002 PROPAGATION OF FRUIT TREES
 077107558810001 PRODUCTION TECHNOLOGY OF FLOWER & FOLIAGE CROPS
 069211318810003 EFFECT OF CALF NUTRITION ON PERFORMANCE OF DAIRY COWS
 069211318810002 FEEDING NAPIER GRASS ON DAIRY COWS
 069211430810001 SHEEP PRODUCTION
 069211519810008 IMPROVEMENT OF INDEGENOUS CATTLE BY ROTATIONAL CROSSING
 069211519810007 BULL PERFORMANCE TESTING & BORAN STUD ESTABLISHMENT
 069211619810006 MILKING IN THE RANGE
 069211519810001 SHEEP PRODUCTION
 069211519810004 GOAT PRODUCTION
 069211519810003 GOAT PRODUCTION
 069211619810002 SAHIVAL & BORAN IN THE MILK & BEEF PRODUCTION
 069211319810001 IMPROVEMENT OF THE NATIONAL SAHIVAL STUD
 066107557610005 FRUIT NURSERY PROPAGATION
 066107558810004 TEMPERATE FRUIT PRODUCTION
 066106558810003 VEGETABLE AGRONOMY
 066106557810002 VEGETABLE SEED PRODUCTION
 066106958810001 PRODUCTION OF HORTICULTURAL CROPS UNDER IRRIGATION
 066110511810002 VARIETY BREEDING
 066110511810001 CLONAL SELECTION
 066110509810004 HERBICIDE SCREENING IN PYRETHRUM
 066110509810003 INTERCROPPING (MAIZE, BEANS, POTATOES) IN PYRETHRUM
 066110509810002 FERTILIZER APPLICATION IN PYRETHRUM
 066110509810001 EFFECT OF SPACING ON YIELD OF PYRETHRUM
 041109811810005 CLONAL SELECTION IN TEA
 041109859810004 CROP PHYSIOLOGY OF TEA
 041109857810003 PROPAGATION TECHNIQUES ON TEA
 041109811810002 TEA SEEDLING STOCKS SELECTION & CROSSED-SEED PRODUCTION
 041109811810001 INHERITANCE OF CHARACTERS IN TEA
 041109855810002 BIOCHEMISTRY OF TEA
 041109860810004 SOIL TEMPERATURE AND TEA GROWTH
 041109801810003 SOIL AND WATER CONSERVATION IN TEA
 041109860810002 STUDIES OF LEAF CANOPY STRUCTURE AND FUNCTION IN TEA
 041109860810001 PLANT/SOIL/WATER RELATIONSHIP OF TEA

041109810810002 PLANT NUTRITION IN TEA
 041108100810001 PLANT NUTRITION IN TEA
 082108509810001 SELECTION AND BREEDING OF CASHEW CLOVES
 082106309810001 FERTILIZATION, ADAPTABILITY, NUTRITIVE (CM)
 082104113810002 CHEMICAL CONTROL / VARIETY SUSCEPTIBILITY TRIALS
 073111856810002 EFFECT OF MANURES ON YIELDS
 073111856810001 SURVEY OF CONSUMER PREFERENCES
 073105509810003 EFFECT OF SEED TREATMENT ON YIELD OF POTATO
 073105509810002 VARIETY / SELECTION TRIALS
 073105509810001 WEED CONTROL IN POTATOES
 068104011810006 PERFORMANCE TESTING OF BARLEY
 069106511810005 VARIETY DESCRIPTION OF HORTICULTURAL CROPS (VEGETABLE)
 068105211810004 PERFORMANCE TESTING OF SUNFLOWER VARIETIES
 068104111810003 PERFORMANCE TESTING OF MAIZE VARIETIES
 068105511810002 PERFORMANCE TESTING OF POTATO VARIETIES
 068106311810001 PERFORMANCE TESTING OF DRY BEAN VARIETIES
 074100210810001 SULPHUR REQUIREMENT OF MAKJENI SOILS
 074110825810003 STORAGE PESTS CONTROL
 074110813810002 STUDIES ON PESTICIDE RESIDUES
 074110813810001 PEST CONTROL IN THE FIELD
 074110813810001 STUDIES ON PESTICIDE FORMULATION
 074100210810007 MAINTENANCE & IMPROVEMENT OF SOIL FERTILITY
 074100210810006 CORRELATION BETWEEN ESP (EXCHANGEABLE SODIUM PERCENT) & S
 074100215810005 INFLUENCE OF HERBICIDES ON SOIL FERTILITY
 074100210810004 SOIL PHOSPHATE INDEXING IN KENYA SOIL
 074100210810003 FERTILIZER PLACEMENT TRIALS
 074100210810002 RAINWATER CONSERVATION FOR CROP USE
 074106310810001 NUTRITION OF BEAN CROP
 074111214810003 RESISTANCE OF FUNGI TO FUNGICIDES IN COFFEE
 074111214810002 BACTERIAL BLIGHT OF COFFEE
 074105514810001 RESISTANCE TO LATE BLIGHT IN POTATOES
 071104111810001 DEVELOPMENT OF MAIZE VARIETIES
 071211318810002 NUTRITION OF DAIRY CATTLE
 071211518810001 NUTRITION OF DAIRY GOATS
 079211519810003 BORAN CATTLE BREEDING
 079211519810002 BREEDING OF BORAN CATTLE
 079211517810001 LIVESTOCK MANAGEMENT
 079303418810001 NUTRITIVE CONTENT OF FORAGE
 079202130810001 RANGE ECONOMICS
 079206018810005 BIOMASS PRODUCTION
 079202102810004 RESEEDING RANGE AREAS
 079201953810003 RANGE IMPROVEMENT
 079202118810002 COMPARISON OF GRAZING SYSTEM
 079201909810001 EFFECTS OF SEASONAL BURNING OF FORAGE SPECIES
 062111912810001 EFFECTS OF PLANT DENSITY ON DISEASE AND PESTS IN GROUNDNUT
 062111809810003 GROUNDNUT IN CROPPING SYSTEMS
 062104509810002 FINGER MILLET AGRONOMY & VARIETY TRIALS
 062104509810001 SORGHUM AGRONOMY
 062104511810001 SORGHUM BREEDING
 062911856810001 POTENTIAL FOR SORGHUM & MILLET PRODUCTION IN WESTERN KENY
 075104314810001 VARIETY INTRODUCTION & SCREENING
 075105209810002 INTERCROPPING OF SUNFLOWER
 075105211810001 VARIETY SCREENING TESTING
 075111713810005 COTTON VARIETAL RESISTANCE TO PESTS
 075111709810004 INTERCROPPING COTTON WITH GRAIN LEGUMES & SUNFLOWER
 075111711810003 YIELD EVALUATION TRIALS
 076111710810002 FERTILIZER RESPONSE IN COTTON
 075111715810001 HERBICIDE SCREENING TESTS IN COTTON
 063111709810003 TIME OF SOWING SPRAYING TRIAL
 063111709810004 WEED CONTROL IN COTTON
 063111710810003 FERTILIZER TRIAL IN COTTON
 063111709810002 SPACING TRIAL IN COTTON
 063111709810001 INTERCROPPING TRIAL IN COTTON
 063111713810004 SOCIO-ECONOMIC STUDIES
 063111713810003 SCREENING OF NEW INSECTICIDES FOR COTTON
 063111713810002 ECONOMIC THRESHOLD LEVEL OF PEST ATTACKS

063111711810004 COTTON VARIETAL RESISTANCE TO PESTS
 063111711810004 HYBRIDISATION AND SELECTION IN COTTON
 063111754810003 BREEDING FOR EARLY MATURING COTTON VARIETIES
 063111754810002 COTTON INTRODUCTION AND EVALUATION
 063111754810001 SELECTION FOR LINT QUALITY
 064105609810001 FERTILIZER STUDIES ON SUGARCANE
 064105512810001 DISEASES OF SUGARCANE
 064105554810001 SUGARCANE VARIETY TRIALS
 065108310810004 BANANA FERTILIZER TRIALS
 065108312810002 BANANA NEMATICIDE PERFORMANCE TRIAL
 065106709810003 ONION VARIETY-SPACING TRIAL
 065108354810001 SWEETBANANA VARIETY TRIAL
 065105254810001 SUNFLOWER VARIETY TRIAL
 065105554810016 SWEET POTATO SCREENING TRIAL
 065105509810015 MOUND AND RIDGE PLANTING TRIAL
 065105509810014 TIME OF HARVESTING SWEET POTATO
 065105509810013 FREQUENCY OF HARVESTING SWEET POTATO VINES
 06511915810012 WEEDING TRIALS
 065104154810010 MAIZE VARIETY TRIALS
 065104115810009 HERBICIDE IN WEED CONTROL ON MAIZE
 065104115810008 WEED CONTROL IN MAIZE
 065104153810007 INTERCROPPING MAIZE WITH BEANS
 065105154810006 SOYBEAN VARIETY TRIAL
 065111954810005 GRJUNDUT VARIETY TRIAL
 065104554810004 SORGHUM VARIETY TRIAL
 065104554810003 FINGER MILLET VARIETY EVALUATION
 065104109810001 MAIZE SPECING TRIAL
 065104109810002 FERTILIZER EXPERIMENT ON MAIZE
 061105911810006 EVALUATION OF NAPIER SEEDLINGS
 061105911810005 PROGENY TEST AND POLY-CROSS EVALUATION OF STAR GRASS
 061105911810004 CLONAL EVALUATION AND VARIETAL TEST ON NAPIER
 061105954810003 PRODUCTIVE POTENTIAL OF RHODES SETERIA AND NAPIER
 061105941810002 NATION FOLDER EVALUATION
 061205913810002 ANIMAL PRODUCTION
 061104110810008 EFFECTS OF MICRONUTRIENTS, LIME, SULPHUR AND POTASSIUM ON MAIZE
 061104110810007 EFFECTS OF DIFFERENT LEVELS OF N & P ON MAIZE YIELD
 061104110810006 PLANT NUTRITION STUDIES ON MAIZE
 061104113810005 MAIZE CROP PROTECTION
 061104115810004 WEED CONTROL IN MAIZE & MAIZE BEAN INTERCROPS
 061104111810002 PHENOTYPIC STUDIES ON MAIZE VARIETIES
 061104110810001 FARM YARD MANURE TRIALS ON MAIZE
 061104111810007 SCREENING OF NEW MAIZE GERM - PLASMA
 061104111810006 POPULATION IMPROVEMENT AND LINE EXTRACTION IN MAIZE
 061104111810004 NATIONAL LATE MATURITY MAIZE VARIETY TRIAL
 061104111810003 SELECTION FOR LODGING RESISTANCE IN MAIZE
 061104111810002 IN-BRED LINE DEVELOPMENT AND EVALUATION IN MAIZE
 061154111810001 POPULATION IMPROVEMENT OF KITALE COMPOSITE MAIZE
 067103948810001 MONITORING OF GRAIN QUALITY
 067105209810002 WEED CONTROL IN SUNFLOWER
 067110813810001 ENTOMOLOGY - GRAIN STORAGE
 067105209810004 SOIL FERTILITY IN SUNFLOWER PRODUCTION
 067104609810003 WHEAT AGRONOMY
 067104611810007 WHEAT VARIETY TRIALS
 067111214810001 DISEASE SURVEYS
 067105311810001 BREEDING OIL SEED CROPS
 067104011810006 FEED BARLEY VARIETY TRIALS
 067104011810005 MALTING BARLEY VARIETY TRIALS
 067104211810004 NATIONAL OAT VARIETY TRIALS
 067104511810002 DURUM VARIETY TRIALS
 067104711810003 TRITICAL VARIETY TRIALS
 067105009810001 RAPE SEED AGRONOMY
 061211513810017 EFFECT OF LUPIN SUPPLEMENTATION ON MILK YIELD
 061211518810016 NUTRITIVE VALUE OF FARM BY-PRODUCTS FED TO CATTLE
 061211318810015 USE OF FODDER IN ZERO GRAZING DAIRY SYSTEMS
 061206513810014 INTAKE AND DIGESTIBILITY OF FODDER BY RUMINANTS
 061106009810013 FODDER SCREENING TRIALS

061106010810012 FERTILIZER & INOCULATION REQUIREMENTS OF LUPIN CULTRA
 061106009810011 SCREENING TRIALS ON HIGH ALTITUDE SORGHUMS
 061106009810010 LUPIN VARIETY EVALUATION TRIAL
 061106009810009 BANA GRASS SPACING OF HARVESTING PRACTICES
 061106009810008 NAPIER GRASS VARIETY TRIAL
 055104355810005 A SOCIAL COST-BENEFIT ANALYSIS
 055105532810004 STUDY OF THE KENYA SUGAR INDUSTRY
 055912332810002 SECTORAL EMPLOYMENT REQUIREMENTS IN KENYA ECONOMY
 055911831810001 TOWARDS A FOOD POLICY FOR KENYA
 051211320810002 RESIDUES OF QUINOLONES IN MILK AFTER DIPPING
 051203520810001 CHLORINATED HYDROCARBON INSECTICIDE IN POULTRY PRODUCER
 051211620810003 CRYOSURGERY & IMMUNOTHERAPY OF SQUAMOUS CELL CARCINOMAS IN CATS
 051203520810002 LIVESTOCK DISEASES (BOVINE PECTIC FEVER)
 051203520810001 HYDATIDOSIS AND CYSTICERCOSIS
 050103855810001 COOPERATIVE IN NYANZA
 050912332810004 RURAL ACCESS ROADS - IMPACT STUDY
 050912332810004 FARM IMPROVEMENT SCHEME (FISS) BASELINE STUDY
 050912332810002 VILLAGE IRRIGATION - LOWER TANA
 049108511810001 SELECTION AND RAPID CLONAL PROPAGATION OF CASHEW TREES
 048210718810002 DEVELOPMENT OF LOCAL FEEDSTUFFS FOR POULTRY
 048210718810001 TREATMENT OF HIGH FIBROUS FORM BY-PRODUCTS TO MAKE THEM EDIBLE
 048200701810004 MICROBIOLOGICAL RESOURCES RESEARCH
 048103815810005 TO IDENTIFY WEED CONTROL METHODS IN VARIOUS CROPS IN KENYA
 048103815810004 PREEMERGENCE HERBICIDES IN WEED CONTROL IN FIELD BEANS
 048106311810003 DEVELOPMENT OF DROUGHT RESISTANCE COWPEAS
 048111214810003 THE SEEDBORNE PATHOGENIC AND BACTERIA OF IMPORTANT GRAIN
 048105514810002 STUDIES ON A MILD MOSAIC DISEASE ON POTATOES (IRISH)
 048111214810001 BACTERIA BLIGHT OF BEANS IN KENYA
 048106101810002 USE 15N TECHNIQUE TO ESTIMATE BIOLOGICAL NITROGEN FIXATION
 048110511810001 PIGEON PEA BREEDING
 030211619810057 REPRODUCTION PERFORMANCE OF BEEF CATTLE ON RANGE
 030105418810056 THREE DIFFERENT SOURCES OF ENERGY IN SUPPLYING RATIONS OF BEEF
 030205818810055 FORAGE PRODUCTION IN RANGELANDS
 030912021810052 LOW COST FARM IMPLEMENTS
 030100202810051 MINIMUM TILLAGE
 030106312810050 INTEGRATED PEST MANAGEMENT OF MAJOR PIGEON PEA INSECT PESTS
 030108012810049 IDENTIFICATION OF VIRUS PATHOGEN IN BANANA, ITS TRANSMISSION
 030107114810048 CROP VIROLOGY PROJECT
 030105414810047 CROP VIROLOGY RESEARCH
 030103814810046 ARMYWORM CONTROL
 03010813810045 RELATIONSHIP BETWEEN MOTH CATCHES IN TRAPS AND OUTBREAKS OF AR
 030105512810044 DETERMINATION OF ECONOMICS IMPORTANCE OF POTATO TUBER MOTH
 030100901810043 SELECTION, ISOLATION AND TESTING OF RHIZOBIUM STRAINS FOR
 030100310810042 FERTILIZER REQUIREMENTS IN DRYLAND AREAS
 030103802810041 DEVELOPING IRRIGATION GUIDELINES USING PLANT STRESS CRITERIA
 030911855710040 ECONOMICS OF VARIOUS CROPPING SYSTEMS
 030100202810039 SOIL PHYSICS
 030104104810038 AGROMETEOROLOGY
 030111855810037 AGRICULTURAL ECONOMICS
 030103814810036 CROP PROTECTION IN DRYLAND AREAS
 030103809810035 AGRONOMICAL ASPECTS
 032609314810053 ARMILLARIA ROOT ROT DISEASE OF PINES
 032609214810054 BIOLOGY & CONTROL OF PATHOGENS CAUSING WOOD ROT & WOOD STAINS
 083211520810034 ISOLATION OF MYCOPLASMA FROM FIELD CASES OF CCPP
 083210720810032 BOVINE BRUCELLOSIS SURVEY
 083210720810031 BRUCELLA ABORTUS VACCINE TRIAL
 083210720810030 FOWL TYPHOID VACCINE DEVELOPMENT
 083210720810029 LEPTOSPIROSIS STUDIES
 083210720810028 ISOLATION & IDENTIFICATION OF OTHER MYCOPLASMAS
 083211520810027 CHEMOTHERAPY OF CCPP
 083211520810026 CONTAGIOUS CAPRINE PLEUROPNEUMONIA VACCINE DEVELOPMENT
 070211519810025 PROGENY TESTING ON BEEF BULLS
 070211641810024 MEDIUM BEEF FEEDLOT PRODUCTION VS GRAZING
 070206009810023 LEGUME LEAF PRODUCTION (STYLOS)
 070205409810022 SWEET POTATO VARIETY TRIAL
 070206009810021 EFFECT OF IMPROVED PHOSPHORUS NUTRITION ON GROWTH OF 4 LEGUMES

040104511810020 COLD TOLERANT SORGHUM VARIETY TRIAL
 070211513810019 EFFECT OF PROTEIN SUPPLEMENTATION ON GROWTH STEERS
 070211518810018 MAIZE STORES AS A SUBSTITUTE FOR ROUTINE SILAGE IN BEEF CATTLE
 040210509810001 DEVELOPMENT OF ROBUSTA COFFEE
 040210514810017 FIELD EVALUATION OF COPPER FORMULATION FOR CBD
 040210510810015 NITROGEN RATES ON HEDGE ROW COFFEE
 040210510810014 EFFECT OF NPK FARMER FEED ON YIELD AND NUTRIENT UPTAKE OF COFFEE
 040210513810013 PARASITIC NEMATODES IN COFFEE
 040210510810012 POPULATION ECOLOGY OF ANTESTIOPSIS SPP
 040210510810011 OTHER POTENTIAL INSECT PESTS
 040210510810010 LARVAL AND PUPAL PARASITISM & NATURE CONTROL
 040210514810009 FIELD SCREENING OF RECOMMENDED PRODUCTS AGAINST
 040210514810008 SCREENING OF OIL SUSPENDED FUNGICIDES AGAINST
 040210555810007 FARM SURVEY ON THE ADOPTION OF CRS RECOMMENDATIONS
 040210555810006 STUDY OF SMALL HOLDER FARMERS PRACTICES & CONSTRAINTS
 040210509810005 FERTILIZERS, WEEDING, PRUNING, INTERCROPPING, PESTICIDES,
 040210509810004 INTERCROPPING IN COFFEE
 040210509810003 WEED CONTROL IN COFFEE
 040210609810002 MANAGEMENT OF HIGH DENSITY COFFEE
 040109809810005 DRY MATTER PRODUCTION AND DISTRIBUTION
 040109803810004 PLANT - SOIL WATER RELATIONSHIPS
 040109809810003 MICRO-CLIMATIC STUDIES OF HIGH DENSITY PLANTINGS
 040109803810002 FLOWERING PATTERNS IN COFFEE
 040109809810001 FLOWERING ABNORMALITY IN COFFEE
 040109814810006 INTEGRATED CONTROL OF BSC AND CBD
 040109814810005 IDENTIFICATION OF RACES OF COLLETOTRICHUM COFFEE ANNUM
 040109814810004 SCREENING FOR RESISTANCE TO CBD
 040109813810003 CONTROL OF LEAF MINER
 040109812810002 FIELD EVALUATION OF FUNGICIDES FOR CBD
 040109814810001 MECHANISMS LEADING TO RESISTANCE AGAINST COFFEE BERRY DISEASE
 040109811810005 INTERSPECIFIC HYBRIDIZATION BETWEEN COFFEE ARABICA AND COFFEE C

 040109811810005 BREEDING FOR COMPACT AND DISEASE RESISTANT VARIETIES
 040109811810004 VARIETY COLLECTIONS INCLUDING THE ETHIOPIAN COLLECTION
 040109811810003 INHERITANCE OF RESISTANCE TO CBD
 040109811810002 METHODS OF SCREENING FOR DISEASE RESISTANCE
 040109811810001 VARIABILITY AND HERITABILITY OF COMPONENT OF YIELD AND QUALITY
 040109810810002 EFFECT OF VARYING RATES OF COFFEE PULP ON 'KIGITU' GRASS
 078104511810001 MILLET BREEDING FOR SEMI ARID AREAS
 078103861810019 FARMING SYSTEMS RESEARCH
 078106111810018 PIGEON PEAS IMPROVEMENT
 078105411810001 IMPROVEMENT OF TUBER CROPS (CASSAVA/SWEET POTATOES)
 078104811810017 CROP IMPROVEMENT (SESAME, SAFFLOWER, BUFFALO HORD AND JOJOBA)
 078106111810001 IMPROVEMENT OF GRAMS - GREEN CHICKPEA, GOLDEN
 078106111810015 IMPROVEMENT OF BEANS (PINTO, LABLAB, TEMPARY, WINGED BEANS)
 078106111810014 IMPROVEMENT OF CHICKPEA
 078112011810013 IMPROVEMENT OF CASTOR
 078103825810012 STUDIES ON INSECT PESTS AND RODENTS CAUSING POST-HARVEST LOSSES
 078103813810011 PEST MANAGEMENT OF FIELD CROPS IN DRYLAND AREA
 078911861810010 FARM UNIT RESEARCH
 078911861810009 FARMER SURVEYS: ECONOMIC EVALUATION OF EXPERIMENTS
 078205817810008 STUDIES IN THE UTILIZATION OF CULTIVATED PASTURE AND FODDER CROP
 078206517810007 STUDIES ON FODDER AND FORAGE CONSERVATION SYSTEMS
 078206017810006 PRODUCTIVITY UTILIZATION AND IMPROVEMENT OF NATURAL PASTURES
 078212117810005 STUDIES IN THE UTILIZATION OF CROP RESIDUES FOR ANIMAL FEEDING
 078206517810004 INVESTIGATIONS ON THE NUTRITIVE VALUE OF FEEDSTUFF
 078206511810003 IMPROVEMENT OF FORAGE PRODUCTION ON ARABLE LAND
 078206017810002 PASTURE IMPROVEMENT
 078212217810001 FEEDING SYSTEMS OF DRAFT ANIMALS FOR EFFICIENT POWER
 032609214810002 CYPRESS CANKER RESEARCH PROGRAMME
 032609313810001 BIOLOGICAL CONTROL OF THE PINE WOLLY APHID USING PREDATORS
 032603205810001 AUTECOLOGY OF JUNIPERUS PROCERA
 032609211810003 ARID AND SEMI-ARID LAND AFFORESTATION
 032609211810002 SPECIES AND PROVENANCE TRIALS
 032609311810001 STUDIES OF INHERITANCE OF DESIRABLE TRAITS IN CYPRESS AND PINE T
 099211753810001 THE FATE OF DDT APPLIED TO COTTON CROPS

099402353810001 IDENTIFICATION AND DETERMINATION OF PESTICIDE RESIDUES IN F.F.I
 099203825810001 SOLAR DRYING OF MAIZE
 099208511810002 RAPID CLONAL PROPAGATION OF CROPS BY TISSUE CULTURE TECHNIQUES
 099211212810003 DISEASE OF ORNAMENTAL PLANTS CAUSED BY FUNGI IN KENYA
 099211214810002 MYCOFLORA OF STORED SEEDS IN KENYA
 099210912810001 BIRD AND MAMMAL PEST CONTROL
 030911855810040 ECONOMICS OF VARIOUS CROPPING SYSTEMS
 040109810810001 LEAF ANALYSIS
 040210501810016 METHODOLOGY
 040210509810001 DEVELOPMENT OF ROBUSTA COFFEE
 041109810810001 PLANT NUTRITION IN TEA
 041109855810001 BIOCHEMISTRY OF TEA
 050912332810003 FARM INPUT SCHEME (FISS) BASELINE STUDY
 061104110810003 MAIZE AGROLOGY
 061104111810001 POPULATION IMPROVEMENT OF KITALE COMPOSITE A BY MASS SELECTION
 061104111810005 POPULATION IMPROVEMENT & LINE EXTRACTION IN MAIZE
 061105911810004 CLONAL EVALUATION & VARIETY TEST ON NAPIER
 061105919810001 EVALUATION OF PASTURE GRASSES
 063111713810001 COTTON VARIETAL RESISTANCE TO PESTS
 065105110810011 SOYBEAN FERTILIZER AND SPACING TRIAL
 065105254810017 SUNFLOWER VARIETY TRIAL
 077106912810002 NEMATOLOGY
 077107309810005 VEGETABLE AGROLOGY
 077107558810001 PRODUCTION TECHNOLOGY OF FLOWER & FOLIAGE CROPS
 078103813810001 PEST MANAGEMENT OF FIELD CROPS IN DRYLAND AREAS
 078105411810017 IMPROVEMENT OF TUBER CROPS (CASSAVA, SWEET POTATO)
 078106111810016 IMPROVEMENT OF GREEN GRAM, CHICKPEA
 082108513810001 CONTROL OF PSEUDOTHERAPIS ON CASHEW TREES
 083211520810034 ISOLATION OF MICROPLASMA FROM FIELD CASES OF CPP
 083211520810026 CONTAGIOUS CAPRINE PLEUROPNEUMONIA SACCINE DEVELOPMENT
 099211214810003 FUNGAL DISEASES OF ORNAMENTAL PLANTS
 061106011810007 HYBRID NAPIER--BJLBUSH MILLET TRIAL
 061210718810014 INTAKE AND DIGESTIVITY OF FODDER BY RUMINANTS
 068106511810005 VARIETAL DESCRIPTION OF HORTICULTURAL CROPS (VEGS)
 069211519810005 SUITABILITY OF SHEEP BREEDS TO VARIOUS ECOLOGICAL ZONES