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THE UNIVERSITY OF TEXAS AT HOUSTON

M. D. ANDERSON HOSPITAL AND TUMOR INSTITUTE

DEPARTMENT OF BIOMATHEMATICS

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A DATA STORAGE, RETRIEVAL
AND
ANALYSIS SYSTEM FOR ENDOCRINE RESEARCH

Prepared Under Contract NAS 9-13042

by

Lawrence E. Newton

and

Dennis A. Johnston, Ph.D.

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JOHNSON SPACE CENTER

ENDOCRINE LABORATORY

October, 1974

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THIS FORM MUST BE COMPLETED BY TYPEWRITER

JSC COMPUTER PROGRAM ABSTRACT

01 4 JSC	01 7 PROGRAM NO J263	01 14 DATE (MMDDYY) 11 27 74

01 20 TITLE OF PROGRAM (62 CHARACTERS MAXIMUM) Storage, Retrieval and Analysis System for Endocrine Research	01 72 SYMBOLIC NAME (9 CHARACTERS MAXIMUM)	PARENT PROGRAM 02 14 CATEGORY	PARENT PROGRAM 02 16 SITE	PARENT PROGRAM 02 19 PROGRAM NO

02 26 CAT-EGORY J	02 27 LANGUAGE NO. 1 FØR4	02 32 LANGUAGE NO. 2	02 37 KEY WORDS (8 MAXIMUM SEPARATED BY COMMAS) SKYLAB, ENDOCRINOLOGY, COMPUTER PROGRAM, INFORMATION RETRIEVAL, BIOASSAY, DATA MANAGEMENT, BIOMEDICAL DATA, BIOMETRICS

WHOM TO CONTACT ABOUT THE PROGRAM

05 14 CONTACT (LAST NAME) Moseley	05 28 SITE JSC	05 31 ORGN CODE DB8	05 39 PROJECT NO - -	05 45 NASA CENTER JSC	05 48 STATUS □ A. UNDER DEVELOPMENT □ B. OPERATIONAL ☒ C. COMPLETED	05 49 □ A. THIS PROGRAM IS NOT FOR SHARING □ B. LIMITED SHARING (SEE ABSTRACT)

DATES — 05 58 REVISION CODE — TIME AND COST FOR DEVELPOMENT

05 50 INITIATED MMYY 07 72	05 54 COMPLETED MMYY 11 74	□ A. REVISION □ B. CANCELLATION	05 59 MAN-MONTHS 59 60 61 62 63	05 64 MACHINE HOURS 64 65 66 67 68	05 69 COMPUTER TYPE CDC 6000	05 74 TOTAL COST (DOLLARS) 2 0 0 0 0 . 74 75 76 77 78 79 80

CARD NUMBER — COLUMN 8 — ABSTRACT — ELITE MARGIN — PICA MARGIN

This retrieval system builds, updates, retrieves, and performs basic statistical analyses on blood, urine, and diet parameters for the M071 and M073 Skylab and Apollo experiments. This system permits data entry from cards to build an indexed sequential file. Programs are easily modified for specialized analyses. This system was developed under Contract NAS 9-13042 by the Department of Biomathematics, M. D. Anderson Hospital and Tumor Institute. Principal Investigator - Dennis A. Johnston, Ph.D.

RELATED DOCUMENTATION (66 CHARACTERS MAXIMUM SEPARATE EACH REF BY COMMAS)

TABLE OF CONTENTS

APPENDICIES

1. INTRODUCTION

One major purpose of the Skylab program was to determine man's adaptability to prolonged spaceflight. NASA experiment M-073 was designed to consider man's response in the areas:

a. Fluid/electrolyte balance;

b. Regulation of calcium metabolism;

c. Regulation of metabolic processes; and a

d. General endocrine/metabolic adaption to a prolonged space environment.

A more detailed description of these studies may be found in Leach [1].

Contract NAS 9-13042 was negotiated to assist the NASA Endocrine Laboratory in the analysis of M-073. It was apparent from the outset of the contract that a storage and retrieval system would be necessary to maintain and statistically analyse the large amounts of diverse data which needed to be analysed. The original system was developed on a Xerox Data Systems Sigma 5 [2] and permitted simplified updating procedures and basic statistical analyses and graphs by astronaut of any selected parameter available on the system.

When M. D. Anderson converted from the XDS Sigma 5 to a Control Data Cyber 73, the system was converted also. This system is documented in this report. The CDC version offers improved file handling abilities, improved throughput due to the increased speed and disk capabilities, and an ease of program change here-to-fore unavailable. This permits rapid and comprehensive analysis of all or selected parameters using general purpose programs with few modifications required. The method of modification is given in Section 7.

2. INPUT DATA FORMATS

All data input into the system is made via punched cards. Seventeen data forms have been developed for this purpose. Copies of these forms are listed in Appendix A. Form 0 is used to enter acceptable sample numbers, type of sample, and record time of collection. Forms 1, 4, 6, 7, 8, 9, 10, 11, and 12 are for parameters obtained from urine type samples. Forms 2, 3, and 5 are used for blood samples. Form 13 is used to record daily weight and water consumption; and Form 15 is used to record daily diet information. Form 14 is used for all updates and changes to all other forms except Form 13 which is updated using Form 14A. It should be noted that sample numbers refer to one and only one sample of either urine or blood (but not both) and that only the appropriate forms and update form type can be filled out using that sample number.

Decimal points are not required or recommended on the forms. Fields are integer unless an implied decimal point is indicated between card columns. For example, an entry of 0120 for EPI (epinephrine) on Form 1 would indicate a value of 12.0 μgm per total volume of sampled urine. Observe then that leading zeros are not required but that trailing zeros are preferred to quarantee the correct positioning of the number.

In this system, no zero, negative values, or totally blank data is valid. Instead, if data is not available or less than determinable, then one of the following codes are used:

-1 -- Test not performed

-2 -- Value is less than determinable

-3 -- Value to follow on update

-4 -- Calculated as combined values

-5 -- Less than a 24 hour period.

These entries should be justified as if they were data values. For example, use -020 for a less than determinable on EPI on Form 1. These are an indication to the computer system, as well as the user, as to why the datum is not present. A value of -2 will be interpreted by the computer as a test value of 0. Any other code will be printed on output but not included as an actual test value.

3. BUILDING AN INITIAL DATA FILE

Program Build is used to create an initial set of data files. Card number 76 in this program controls the function of the program. This card must set INITIAL=0 to create new files. Since this program then expects to create new files on mass storage the user must insure that none of the files to be built exist. See Section 3.1 for a sample deck.

There are four files required in the retrieval system and it is necessary that each of the files contain at least one record. File RA1 is the sample directory file and is a random file with the sample number as the key for each record. There must be one and only one record in this file for every sample. This file is built from sample directory cards which are punched from form zero. The sample directory cards must be in order of increasing sample number. For each sample number in file RA1 there must be a record with a corresponding sample number in either RA2, the Urine file, or RA3, the Blood file, but a given sample number must not appear in both RA2 and RA3. Both RA2 and RA3 are keyed on sample number.

Within files RA2 and RA3, each record is composed of data from one or more data cards. During creation of a file, it is not possible to replace an existing record, therefore, only one type of card for each file is permissable. It is suggested that only card forms 0, 1, 2 and 13 appear in a creation deck and that at least one of each of these appear. The simplist way is to include only one of each card type in the initial creation, however, this will not produce an efficient file structure. Refer to section 2 for form numbers.

The build program will make few checks on the cards, but will print an error message if addition of an existing sample number is attempted. The program TYPLOK described later will perform further file integrity checks.

The fourth file, RA4, is the daily parameter file. This file is not associated with the sample directory. The key for each record in the file is the study number concatenated with the Julian date from the daily parameter card. The cards for this file (13 cards only) must be in ascending study order and ascending date within study.

A card with 99 in columns 1 and 2 or an end of file terminates the program.

3.1 Sample deck to build a new file (CREATE deck)

```
NASA,CM600000.
ACCOUNT,AN12318.
GET,OPL=BUILDPL.
MODIFY,LO=CET,F.
FTN,I.
LGO.
SAVE,RA1.
SAVE,RA2.
SAVE,RA3.
SAVE,RA4.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT
EXIT.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
7/8/9   (EOR)
*IDENT UPDT
*DECK BUILD
*D 76
7/8/9   (EOR)
        (Deck of data cards punched from forms
         in the order described in Section 3)
6/7/8/9 (EOI)
```

4. UPDATING AN EXISTING FILE

Program BUILD is used to update existing files. Source card number 76 must be set INITIAL=1 to update existing files. Any valid card in any order may be used to update a file.

Sample directory or daily parameter records, card codes 00 and 13, may be added, but existing records of this type cannot be replaced unless previously deleted. Sample directory records may be updated by use of 14 cards, and a daily parameter record may be updated by use of 14A cards.

Any complete record may be deleted by use of a 98 card. This will delete a record by file number and key.

All other record types may be added, or all of the information within a record which is contained on one card may be replaced by entering the card, or any field may be changed by use of a 14 card. The retrieval index shows which values within a record are contained on a particular card form and the value index to be used on a 14 card.

4.1 Checking Files

The program BUILD does not cross check the urine, blood and sample directory files. Program TYPELOK performs a number of cross checks on these files and prints some tables showing the actual number of data points within the files. The output of this program is necessarily condensed and therefore intended as a programmers maintenence tool only.

4.2 Sample deck to modify an existing file (UPDATE deck)

```
NASA,CM60000.
ACCOUNT,AN12318.
GET,OPL=BUILDPL.
MODIFY,LO=GET,F.
FTN,I,L=0.
GET,RA1.
GET,RA2.
GET,RA3.
GET,RA4.
LGO.
REPLACE,RA1.
REPLACE,RA2.
REPLACE,RA3.
REPLACE,RA4.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
EXIT.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
7/8/9
*IDENT UPDT
*DECK BUILD
*D 77
7/8/9
          (Deck of cards for additions or
           modifications)
6/7/8/9
```

5. HOW TO RETRIEVE AND PROCESS THE DATA

The program is logically in two parts, the first part retrieves the data, the second part performs the analysis on the data. Data is retrieved for one mission (study) over one or more ranges of consecutive dates and for one test. Data is retrieved for man 1, 2, and 3 in order, and data for each individual is passed to the second part of the program one man at a time. Those statistical analyses which require data for all men simultaneously must modify a section of the statistics routine to save the necessary data. See section 7.

A basic series of statistical tests are performed for each man and varies depending on the available data. Data is sectioned into preflight, inflight and post flight time periods. All analyses assume date is the independent variable and test value the dependent variable.

The program requires a series of data cards to control the data retrieval and all data is retrieved from the four files described in sections 3 and 4. Appendix E shows the control card functions.

To retrieve data it is necessary to select the mission (study), the test type, the dates and the test name. By reference to Table E.3, the codes for the 5 available studies and the 9 test types may be found. Reference to Table B1 will show the code number index for the various tests. It is necessary to know which type of sample was used for a given test. For instance, to obtain the information on Blood insulin, test number 304, it is necessary to realize that only blood sample types are meaningful. Blood sample types are codes 5, 6, 7 or 9 from Table E.3. It is possible to retrieve on all 4 possibilities and the program will generate a separate report for each type indicating the empty types. Program TYPLOK will produce a table of the number of entries by sample, type and study. The TYPLOK printout currently shows that for Skylab 3 (study 3) and Blood insulin (test 304) that only plasma samples (type 5) were evaluated. It is then necessary to know the Julian dates of interest. Table E.3 shows the inclusive Julian dates of the various studies. By refering to these tables and the control card descriptions the following cards will retrieve the desired information.

JOB DATE 1300	Job card requesting date vs data Run number 1300 greater than 1000 indicates plots
STUDY EACH 3	Study 3 (Skylab 3)
DATE ALL	All days
TYPE EACH 5	Only type 5 (Plasma) samples are available
TEST EACH 304	Test 304 (Insulin)
END	End of Job
EOF	End of Control Cards.

6. DESCRIPTION OF THE BASIC STATISTICAL ANALYSIS PROGRAM

Several basic statistical tests, contrasts, and comparisons are made routinely when the statistical analysis of a test is requested. These analyses are performed on each astronaut separately. Appendix C contains a sample analysis for urinary calcium for the Commander of Skylab III. The analyses are performed on the Commander, Pilot and Support Pilot (or support person if requested) in order and consist of:

1. A diagnostic heading which contains:
   a. Retrieval parameters LSTUDY (number of study selected), LMAN (astronaut number), JOB (job type), LTYPE (sample type), NSMP and NDATA (number of samples retrieved), and LTEST (test number). These are described in more detail in section 5.

   b. Data actually retrieved include MTVOL (total volumes retrieved, --zero if no volumes retrieved), MDATE (Julian sample dates), LHIT (sample numbers), XDATE (test results in sample). Corresponding rows and columns of these four arrays correspond. That is, on this analysis, no total volume was retrieved for Julian Date 188 which had urine sample number 1443 and calcium reading of 8.2.

2. Listing of the data retrieved. The data is listed with Julian Date versus sample value separated into preflight, inflight

and post flight, respectively. Means, standard deviations, and sample sizes for each time period are listed. Data points exceeding the 95% tolerance region (above +2 standard deviations from the overall mean) are denoted with a single "+" sign, above 99% (+2.5 std. dev.) with "++", below 95% (-2 std. dev.) with "-" and below 99% (-2.5 std. dev.) with "--".

3. The means, standard deviations, and standard errors are summarized by time with the overall values also given.

4. A one-way analysis of variance is performed using preflight, inflight, and postflight as the three groups in the analysis. When only two of the groups are available, the analysis of variance is performed on the two groups. An analysis of variance table is given as well as the statement of statistical significance.

19.070 is significant at the .1 percent level for the CDR in the example of Appendix C. This means that the F-ratio of the test is significant at .1% or that the pre-, in-, and post flight readings of calcium are different at the 99.9% significance level. Normally, a 1% or 5% is considered statistically significant.

If the F-ratio is significant at the 5% or smaller level, then standard contrasts of pre- to in-, in- to post-, and pre- to post flight are performed with an F-ratio and level given for each contrast. For the CDR in Appendix C, inflight is statistically significantly different from both preflight and post flight but pre- and post flight are not significantly different from each other. Examination of the values of the means would then interpret the differences as a statistically significant increase in calcium in the urine inflight with a statistically significant return to normal preflight levels post flight.

The analysis of variance was performed using the IMSL [3] routine ACRDAN. Mean squares and F-ratios are calculated by the program. Significance levels are calculated by the STATCAT [4] routines FISH and PHI. The contrasts are calculated using the IMSL [3] routine ACTRST.

5. Non-parametric tests of the Wilcoxon/Kruskal-Wallis type using preflight, inflight, and post flight as the three groups in the analysis. When only two of the groups are available, the tests are performed on the two groups. The groups are pooled, ordered in increasing order, and each observation is scored. The scores are summed by group and then combined giving the weighted score WSCORE. A level is given in the manner of the one way analysis of variance. For the CDR in Appendix C, we have a WSCORE of 38.985 which is significant at the .1% level (99.9% significance) and consequently statistically significant.

Contrasts are also performed when the test is significant at the 5% level or less. The contrasts are Wilcoxon two sample statistical tests. The ordering, Wilcoxon-type signed ranks, the ranked score W, the standard deviation and the asymptotic normal score are all given. Since the hypothesis could be either one-sided (calcium inflight is higher than calcium preflight) or two-sided (calcium inflight is different than calcium preflight), both one- and two-sided levels are given.

The routine which yields the ordered arrays and scores for both the combined analyses is the Kruskal-Wallis routine of Lee and Desu [5]. The selection of which data to use is performed by the control program.

6. Plots of the data are also produced on request (see Appendix E for request formats). The plots produced for urinary calcium on Skylab III are shown in Appendix C.

7. MODIFYING THE PROGRAM FOR SPECIAL ANALYSIS

For performing various special analyses, the program must be modified to accomodate the analysis program. Since all of the data for each astronaut is available in the subroutine STAT, usually all modifications are made only in STAT. Restructuring the data and calling of necessary routines is done from STAT.

Generally, the specialized nature of various analyses requires a programmer with some familiarity with both this retrieval and analysis program and the program to do the special analysis. As an aid to this method of program modification, all program modifications are made using a CDC system called MODIFY. By using this system it is possible to keep one copy of the standard program with all updates included and use MODIFY to create each special program as it is needed without disturbing the base program.

The subroutine STAT receives all of the data for one man at a time. The following variables and their meaning are those normally used by a special program:

LMAN(1)	Current man number
NOBS	Total data points
NNN(1)	Number data points in preflight
NNN(2)	Number data points inflight
NNN(3)	Number data points in post flight
X	Data array in date order
MDATE	Array of corresponding dates
ICASE	0 No tests or no preflight
	1 Preflight only
	2 Pre- and inflight only
	3 All
	4 Pre and post flight only

These values and arrays are good only immediately after statement 330 in STAT. Note that bad values have been edited out and certain following subroutines rearrange the data.

Two examples of program modifications are included in the program listings. The card decks used to create these modifications are listed with the resulting programs in Appendix D. The statistical details of the examples are given in [6].

8. REFERENCES

1. Leach, Carolyn S., "Skylab Endocrine-Metabolic Studies", to appear in *Aerospace Medicine*.

2. Giese, R. P., *A Data Storage and Retrieval System for Endocrine Research*, Contract NAS 9-13042, Department of Biomathematics, M. D. Anderson Hospital and Tumor Institute, 6723 Bertner, Houston, Texas, December, 1973.

3. *IMSL Library 3 Reference Manual*, Third Edition, International Mathematical and Statistical Library, Inc., 6200 Hillcroft, Houston, Texas, December, 1973.

4. Johnston, D. A. and Smith, E. O., *STAT-CAT -- A Statistical Catalog of Subroutines and Function Subroutines*, Revision 1, Computation and Analysis Division, Johnson Space Center, Program Sharing nos. C-MSC-C057, M71-50067, Febrauary, 1971.

5. Lee, E. T., and Desu, M. M., "A Computer Program for Comparing K Samples With Right-Censored Data", *Computer Programs in Biomedicine*, 2 (1972).

6. Johnston, Dennis A., Statistical Analysis of Skylab III, Contract NAS 9-13042, Department of Biomathematics, M.D. Anderson Hospital and Tumor Instutute, 6723 Bertner, Houston, Texas, November, 1974.

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0. SAMPLE DIRECTORY

APPROVED FOR KEYPUNCHING__________ Date__________
KEYPUNCHED BY__________ Date__________

	FORM	SAMPLE NUMBER	STUDY	Julian Date	MAN	TYPE	GMT	Date Collected			TOTAL Volume ml	Bag Vol ml	Bag Number	VDR	MASTER SAMPLE No. (POOL)	REMARKS
								MO	DA	YR						
	1 2	3 4 5 6	7	8 9 10	11	12 13	14 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
1	0 0															
2	0 0															
3	0 0															
4	0 0															
5	0 0															
6	0 0															
7	0 0															
8	0 0															
9	0 0															
10	0 0															
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33	0 0															
34	0 0															
35	0 0															

APPENDIX A - Data Coding Forms

1. URINE HORMONES

APPROVED FOR KEYPUNCHING_____ Date________
Keypunched by______________ Date________

	FORM	SAMPLE NUMBER	EPI UG/TV	NOREPI UG/TV	ADH MU/TV	HYDRO UG/TV	ALDO UG/TV	17OH MG/TV	5HIAA	
	1 2	3 4 5 6	7 8 9 10	11 12 13 14	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
1	0 1									
2	0 1									
3	0 1									
4	0 1									
5	0 1									
6	0 1									
7	0 1									
8	0 1									
9	0 1									
10	0 1									
11	0 1									
12	0 1									
13	0 1									
14	0 1									
15	0 1									
16	0 1									
17	0 1									
18	0 1									
19	0 1									
20	0 1									
21	0 1									
22	0 1									
23	0 1									
24	0 1									
25	0 1									
26	0 1									
27	0 1									
28	0 1									
29	0 1									
30	0 1									
31	0 1									
32	0 1									
33	0 1									
34	0 1									
35	0 1									

2. PLASMA HORMONES SHORT TERM

APPROVED FOR KEYPUNCHING____________________ DATE__________

KEYPUNCHED BY____________________ DATE__________

	FORM	SAMPLE NUMBER	HYDRO ug/100 ml	ALDO pg/ml	HGH ng/ml	ANGIO mug/ml/hr	INSULIN uU/ml	T4 ug/100 ml	ACTH	ADH	TESTOS	
	1 2	3 4 5 6	7 8 9 10	11 12 13 14	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
1	0 2											
2	0 2											
3	0 2											
4	0 2											
5	0 2											
6	0 2											
7	0 2											
8	0 2											
9	0 2											
10	0 2											
11	0 2											
12	0 2											
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16	0 2											
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30	0 2											
31	0 2											
32	0 2											
33	0 2											
34	0 2											
35	0 2											

APPROVED FOR KEYPUNCHING ____________ Date ________
KEYPUNCHED BY ____________ Date ________

3. PLASMA HORMONES LONG TERM

	F O R M	SAMPLE NUMBER	PTH pg/ml	CAL pg/ml	VIT.D ng/ml	ACTH pg/ml	TSH	
	1 2	3 4 5 6	7 8 9 10 11	12 13 14 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
1	0 3							
2	0 3							
3	0 3							
4	0 3							
5	0 3							
6	0 3							
7	0 3							
8	0 3							
9	0 3							
10	0 3							
11	0 3							
12	0 3							
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15	0 3							
16	0 3							
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24	0 3							
25	0 3							
26	0 3							
27	0 3							
28	0 3							
	0 3							
3								
32	0 3							
33	0 3							
34	0 3							
35	0 3							

APPROVED FOR KEYPUNCHING__________Date__________
KEYPUNCHED BY__________________Date__________

4. URINE CHEMISTRIES

	FORM	SAMPLE NUMBER	OSMO mOsm/TV	Na mEq/TV	K mEq/TV	Mg mEq/TV	PO4 mg/TV	Ca mEq/TV	Cl mEq/TV	H ml 0.1N NaOH/vol	SP GR	Creat mg/TV	Uric Acid mg/TV	
	1 2	3 4 5 6	7 8 9 10	11 12 13 14	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
	0 4													
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	0 4													
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15	0 4													
16	0 4													
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27	0 4													
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31	0 4													
32	0 4													
33	0 4													
34	0 4													
35	0 4													

5. BLOOD CHEMISTRIES

APPROVED FOR KEYPUNCHING ________ Date ______
KEYPUNCHED BY ____________ Date ______

	FORM	SAMPLE NUMBER	OSMO mOsm/l	Na mEq/l	K mEq/l	Mg mg %	PO_4 mg %	Ca mg %	Cl mEq/l	Glu mg %	TP Gm %	
	1 2	3 4 5 6	7 8 9 10	11 12 13 14	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
1	0 5											
2	0 5											
3	0 5											
4	0 5											
5	0 5											
6	0 5											
7	0 5											
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6. TRACE METALS (URINE)

APPROVED FOR KEYPUNCHING ________ Date ________
KEYPUNCHED BY ________ Date ________

	FORM	SAMPLE NUMBER	B ug/ml	Si ug/ml	Fe ug/ml	Al ug/ml	Mo ug/ml	Cu ug/ml	Zn ug/ml	Ti ug/ml	Ni ug/ml	Sr ug/ml	Cr ug/ml	Bi ug/ml	Mn ug/ml	Li ug/ml	Rb ug/ml	
	1 2	3 4 5 6	7 8 9 10	11 12 13 14	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
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APPROVED FOR KEYPUNCHING_____ Date_________

KEYPUNCHED BY__________Date_________

7. 17 KETO STEROIDS (URINE)

	FORM	SAMPLE NUMBER	PD mg/TV	AND mg/TV	ETIO mg/TV	DHEA mg/TV	11=0 AND mg/TV	11=0 ETIO mg/TV	11OH AND mg/TV	11OH ETIO mg/TV	TOTAL Tmg/TV	
	1 2	3 4 5 6	7 8 9 10 11	12 13 14 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
1	0 7											
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APPROVED FOR KEYPUNCHING__________ Date__________
KEYPUNCHED BY__________ Date__________

8. TOTAL AMINO ACIDS BASIC (URINE)

	FORM	SAMPLE NUMBER	Lys mg/TV	His mg/TV	NH_3x10^3 mg/TV	Arg mg/TV	
	2	3 4 5 6	7 8 9 10 11	12 13 14 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
1	0 8						
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9. TOTAL AMINO ACIDS (URINE)
ACID AND NEUTRAL

APPROVED FOR KEYPUNCHING__________ Date__________
KEYPUNCHED BY__________ Date__________

	FORM	SAMPLE NUMBER	HyP mg/TV	Asp mg/TV	Thr mg/TV	Ser mg/TV	Glu mg/TV	Pro mg/TV	Gly mg/TV	Ala mg/TV	Cys/2 mg/TV	Val mg/TV	Met mg/TV	Ile mg/TV	Leu mg/TV	Tyr mg/TV	Phe mg/TV	——
	1 2	3 4 5 6	7 8 9 10	11 12 13 14 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
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APPROVED FOR KEYPUNCHING________Date________
KEYPUNCHED BY____________Date________

10. FREE AMINO ACIDS BASIC (URINE)

	FORM	SAMPLE NUMBER	Hlys mg/TV	γ-AB mg/TV	Orn mg/TV	Eth mg/TV	NH_3x10^3 mg/TV	Lys mg/TV	1-CH_3-His mg/TV	His mg/TV	3-CH_3-His mg/TV	Ans mg/TV	Try mg/TV	Cre mg/TV	Car mg/TV	Arg mg/TV	
	1 2	3 4 5 6	7 8 9 10 11	12 13 14 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
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11. FREE AMINO ACIDS (URINE)
ACID AND NEUTRAL

APPROVED FOR KEYPUNCHING ______ Date ______
KEYPUNCHED BY ______ Date ______

	F O M	SAMPLE NUMBER	Pser mg/TV	Petn mg/TV	Tar mg/TV	Urea x 10^{-3} mg/TV	Hyp mg/TV	Asp mg/TV	Thr mg/TV	Ser mg/TV	Asp NH$_2$ mg/TV	GluNH$_2$ mg/TV	Sar mg/TV	Pro mg/TV	Glu mg/TV	Cit mg/TV	GlcNH$_2$ mg/TV
	1 2	3 4 5 6	7 8 9 10 11	12 13 14 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
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APPROVED FOR KEYPUNCHING__________ Date__________
KEYPUNCHED BY__________ Date__________

12. FREE AMINO ACIDS (URINE)
ACID AND NEUTRAL

	FORM	SAMPLE NUMBER	Gly MG/TV	Ala mg/TV	α AA mg/TV	α AB mg/TV	Val mg/TV	Cys/a mg/TV	Cyt mg/TV	Met mg/TV	Ile mg/TV	Leu mg/TV	Tyr mg/TV	Phe mg/TV	β-Ala mg/TV	β-Aib mg/TV	
	1 2	3 4 5 6	7 8 9 10 11 12	13 14 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
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13. DAILY PARAMETERS

APPROVED FOR KEYPUNCH BY________________ DATE________
KEYPUNCHED BY________________ DATE________

	FORM	STUDY	JULIAN DATE	BODY WEIGHT (LBS)			H_2O CONSUMPTION (ML)			PHYSICAL ACTIVITIES AND/OR ENVIRONMENTAL CONDITIONS
				CDR	PLT	SPT	CDR	PLT	SPT	
	1 2	3	4 5 6	7 8 9 10 11	12 13 14 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
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35	1 3			•	•	•				

14. UPDATE FORM

	FORM	SAMPLE NUMBER	FORM NO.	ITEM	DATA	
	1 2	3 4 5 6	7 8	9 10	11 12 13 14 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
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33	1 4					
34	1 4					
35	1 4					

15. DIET PARAMETERS

APPROVED FOR KEYPUNCHING ____________ DATE ________
KEYPUNCHED BY ____________ DATE ________

	FORM	SAMPLE NUMBER	CALORIES Kcal	PROTEIN g	Ca mg	P mg	Na mg	Mg mg	K mg	H_2O ml	WEIGHT Lbs	VOL Vdr	
	1 2	3 4 5 6	7 8 9 10	11 12 13 14	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
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14. A UPDATE FORM For Form 13

	FORM	JULIAN DATE	FORM NO	ITEM	DATA	STUDY	
	2	3 4 5 6	7 8	9 10	11 12 13 14 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
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9	1 4		1 3		●		
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27	1 4		1 3		●		
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33	1 4		1 3		●		
34	1 4		1 3		●		
35	1 4		1 3		●		

APPENDIX B - Retrieval Index

APPENDIX B

The following table lists:

INDX	A Test Number for Each Test
INDX1	Record Type (B=Blood, U=Urine)
INDX2	Name of Test
INDX3	Word Number of Record
INDX4	Form Number where Data was Punched (See Appendix E for use)
INDX5	Field Number of Input Form (See Appendix E for use)

TABLE B.1 RETRIEVAL INDEX

RETRIEVAL INDEX

INDX	INDX1	INDX2	INDX3	INDX4	INDX5	
TEST NUMBER	RECORD TYPE	NAME	WORD NUMBER OF RECORD	FORM NO.	FIELD NO.	U/L BOUND
300	B	HYDRO	2	2	3	
301	B	ALDO	3	2	4	
302	B	HGH	4	2	5	
303	B	ANGIO	5	2	6	
304	B	INSULIN	6	2	7	
305	B	T4	7	2	8	
306	B	ACTH	8	2	9	
307	B	ADH	9	2	10	
321	B	TESTOS	10	2	11	
308	B	PTH	11	3	3	
309	B	CAL	12	3	4	
310	B	VIT.C.	13	3	5	
311	B	TSH	14	3	6	
312	B	OSMO	15	5	3	
313	B	Na	16	5	4	
314	B	K	17	5	5	
315	B	Mg	18	5	6	
316	B	PO_4	19	5	7	
317	B	Ca	20	5	8	
318	B	Cl	21	5	9	
319	B	Glu	22	5	10	
320	B	TP	23	5	11	
322	(not used)					
323	(not used)					

TABLE B.1 RETRIEVAL INDEX (Continued)

RETRIEVAL INDEX

INDX	INDX1	INDX2	INDX3	INDX4	INDX5	
TEST NUMBER	RECORD TYPE	NAME	WORD NUMBER OF RECORD	FORM NO.	FIELD NO.	U/L BOUND
400	U	EPI	2	1	3	
401	U	NOREPI	3	1	4	
402	U	ADH	4	1	5	
403	U	HYDRO	5	1	6	
404	U	ALDO	6	1	7	
405	U	17OH	7	1	8	
503	U	5HIAA	8	1	9	
406	U	OSMO	9	4	3	
407	U	Na	10	4	4	
408	U	K	11	4	5	
409	U	Mg	12	4	6	
410	U	PO_4	13	4	7	
411	U	Ca	14	4	8	
412	U	Cl	15	4	9	
413	U	H	16	4	10	
414	U	Sp.Gr.	17	4	11	
415	U	Creat	18	4	12	
416	U	Uric Acid	19	4	13	
417	U	B	20	6	3	
418	U	Si	21	6	4	
419	U	Fe	22	6	5	
420	U	Al	23	6	6	
421	U	Mo	24	6	7	
422	U	Cu	25	6	8	
423	U	Zn	26	6	9	
424	U	Ti	27	6	10	
425	U	Ni	28	6	11	
426	U	Sr	29	6	12	
427	U	Cr	30	6	13	
428	U	Bl	31	6	14	
429	U	Mn	32	6	15	
430	U	Li	33	6	16	
431	U	Rb	34	6	17	
432	U	PO	35	7	3	
433	U	AND	36	7	4	
434	U	ETIO	37	7	5	
435	U	DHEA	38	7	6	
436	U	11=0 AND	39	7	7	
437	U	11=0 ETIO	40	7	8	
438	U	11OH AND	41	7	9	
439	U	11OHETIO	42	7	10	
440	U	TOTAL	43	7	11	

TABLE B.1 RETRIEVAL INDEX (Continued)

RETRIEVAL INDEX

INDX	INDX1	INDX2	INDX3	INDX4	INDX5	
TEST NUMBER	RECORD TYPE	NAME	WORD NUMBER OF RECORD	FORM NO.	FIELD NO.	U/L BOUND
441	U	Lys	44	8	3	
442	U	His	45	8	4	
443	U	NH_3	46	8	5	
444	U	Arg	47	8	6	
445	U	Hyp	48	9	3	
446	U	Asp	49	9	4	
447	U	Thr	50	9	5	
448	U	Ser	51	9	6	
449	U	Glu	52	9	7	
450	U	Pro	53	9	8	
451	U	Gly	54	9	9	
452	U	Ala	55	9	10	
453	U	Cys/2	56	9	11	
454	U	Val	57	9	12	
455	U	Met	58	9	13	
456	U	Ile	59	9	14	
457	U	Leu	60	9	15	
458	U	Tyr	61	9	16	
459	U	Phe	62	9	17	
460	U	Hlys	63	10	3	
461	U	γ-AB	64	10	4	
462	U	ORN	65	10	5	
463	U	ETH	66	10	6	
464	U	NH_3	67	10	7	
465	U	Lys	68	10	8	
466	U	1-CH_3-His	69	10	9	
467	U	His	70	10	10	
468	U	3-CH_3-His	71	10	11	
469	U	ANS	72	10	12	
470	U	Try	73	10	13	
471	U	Cre	74	10	14	
472	U	Car	75	10	15	
473	U	Arg	76	10	16	
474	U	Pser	77	11	3	
475	U	Petn	78	11	4	
476	U	Tar	79	11	5	
477	U	Urea	80	11	6	
478	U	Hyp	81	11	7	
479	U	Asp	82	11	8	
480	U	Thr	83	11	9	
481	U	Ser	84	11	10	
482	U	$AspNH_2$	85	11	11	

TABLE B.1 RETRIEVAL INDEX (Continued)

RETRIEVAL INDEX

INDX	INDX1	INDX2	INDX3	INDX4	INDX5	
TEST NUMBER	RECORD TYPE	NAME	WORD NUMBER OF RECORD	FORM NO.	FIELD NO.	U/L BOUND
483	U	$GluNH_2$	86	11	12	
484	U	Sar	87	11	13	
485	U	Pro	88	11	14	
486	U	Glu	89	11	15	
487	U	Cit	90	11	16	
488	U	$GlcNH_2$	91	11	17	
489	U	Gly	92	12	3	
490	U	Ala	93	12	4	
491	U	αAA	94	12	5	
492	U	αAB	95	12	6	
493	U	Val	96	12	7	
494	U	Cys/2	97	12	8	
495	U	Cyt	98	12	9	
496	U	Met	99	12	10	
497	U	Ile	100	12	11	
498	U	Leu	101	12	12	
499	U	Tyr	102	12	13	
500	U	Phe	103	12	14	
501	U	β-ALa	104	12	15	
502	U	β-Aib	105	12	16	
514	U	VolVDR	116	15	12	
515	U Diet	Cal	117	15	3	
516	U Diet	Prot	118	15	4	
517	U Diet	Ca	119	15	5	
518	U Diet	P	120	15	6	
519	U Diet	Na	121	15	7	
520	U Diet	Mg	122	15	8	
521	U Diet	K	123	15	9	
522	U Diet	H_2O	124	15	10	
523	U	Weight	125		11	

APPENDIX C - Sample Basic Statistical Analysis

```
                    NASA MSC ENDOCRINE DATA RETREIVAL PROGRAM.    400

LSTUDY        3         0         0         0         0         0         0         0         0         0

 LMAN         1         0         0         0         0         0         0         0         0

JOB JOB      DATE      3400   -0    -0    -0    -0    -0    -0    -0    -0    -0    -0    -0    -0    -0

LTYPE    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0

NSMP =   101           NDATA =    101
LDATE
       0
LTEST         411

MTVOL
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0         0         0         0         0         0         0         0         0         0
       0

MDATE
     188       189       190       191       192       193       194       195       196       197
     198       199       200       201       202       203       204       205       206       207
     208       209       209       210       211       212       213       214       215       216
     217       218       219       220       221       222       267       268       268       269
     270       271       272       273       274       275       276       277       278       279
     280       251       252       253       254       255       256       257       258       259
     260       261       262       263       264       265       266       281       282       237
     238       239       241       242       243       244       245       246       247       248
     249       250       266       283       223       224       225       226       227       228
     229       230       231       232       233       234       235       236       240       284
     285

LHIT
    1443      1454      1469      1475      1481      1516      1521      1528      1537      1539
    1545      1551      1562      1584      1590      1601      1602      1612      1615      1626
    1627      1683      1684      1688      1691      1694      1697      1700      1703      1706
    1709      1712      1715      1718      1721      1724      1759      1761      1771      1774
    1775      1790      1793      1798      1799      1805      1806      1809      1812      1815
    1818      1821      1824      1827      1830      1833      1836      1839      1842      1845
    1848      1851      1854      1857      1860      1863      1866      1869      1898      1899
    1902      1905      1908      1911      1914      1917      1920      1923      1926      1929
    1932      1935      1938      1941      1944      1947      1950      1953      1956      1959
    1962      1965      1968      1971      1974      1977      1980      1983      1986      1991
    1994

XDATA
      8.200000       8.000000       6.200000       8.700000       6.800000       5.000000       5.600000       6.000000
      6.700000       7.700000       7.800000       6.800000       5.900000       7.100000       7.600000       9.500000
      6.200000       6.700000       7.400000       5.700000       8.200000       7.500000      14.100000      10.300000
      6.600000       9.800000       8.300000       7.900000       9.100000       9.100000      11.000000       9.400000



      8.600000       8.800000       9.800000      10.000000       4.500000      10.200000       3.100000       9.100000
      7.000000      10.400000       8.500000       5.500000       7.200000       8.800000      11.000000       9.800000
      7.500000       7.900000       9.400000      10.800000      11.000000      10.300000      19.800000      11.900000
      8.800000      11.600000      11.200000       9.500000      10.500000      10.400000      10.300000       8.400000
     11.700000      10.700000      12.900000       6.700000       6.900000       9.700000       7.800000      11.800000
     11.100000      10.500000       9.200000      10.000000      11.800000      10.400000      11.400000       9.200000
      9.100000      10.500000      -5.000000       9.100000      10.500000      10.700000      14.300000       9.100000
     12.700000      10.800000      10.200000       8.600000      11.800000       9.600000      12.000000      12.300000
     10.100000      10.900000      11.500000       7.800000       8.800000
```

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```
                      NASA MSC ENDOCRINE DATA RETREIVAL PROGRAM.   340

STUDY, 3  SKYLAB 3                          74/04/26.

TEST,411  CA                               MAN,    1  CDR

TYPE,   1

JULIAN DATE   MEQ/TV
      188      8.2000
      189      8.0000
      190      6.2000
      191      8.7000
      192      6.8000
      193      5.0000
      194      5.6000
      195      6.0000
      196      6.7000
      197      7.7000
      198      7.8000
      199      6.8000
      200      5.9000
      201      7.1000
      202      7.8000
      203      9.5000
      204      6.2000
      205      6.7000
      206      7.4000
      207      5.7000
      208      8.2000
      209      7.5000
      209     14.1000          ++

MEAN =       7.374     SD  =       1.832     N = 23


      210     10.3000
      211      6.6000
      212      9.8000
      213      8.3000
      214      7.9000
      215      9.1000
      216      9.1000
      217     11.0000          +
      218      9.4000
      219      8.6000
      220      8.8000
      221      9.8000
      222     10.0000
      223     10.5000          +
      224     10.7000          +
      225     14.3000          ++
      226      9.1000
      227     12.7000          ++
      228     10.8000          +
      229     10.2000
      230      8.6000
      231     11.8000          ++
      232      9.6000
```

```
     233       12.0000          ++
     234       12.3000          ++
     235       10.1000
     236       10.9000          +
     237        9.7000
     238        7.8000
     239       11.8000          ++
     240       11.5000          +
     241       11.1000          +
     242       10.5000          +
     243        9.2000
     244       10.0000
     245       11.3000          ++
     246       10.4000          +
     247       11.4000          +
     248        9.2000
     249        9.1000
     250       10.9000          +
     251       10.8000          +
     252       11.0000          +
     253       10.3000
     254       19.8000          ++
     255       11.9000          ++
     256        8.8000
     257       11.6000          +
     258       11.2000          +
     259        9.5000
     260       10.5000          +
     261       10.4000          +
     262       10.3000
     263        8.4000
     264       11.7000          ++
     265       10.7000          +
     266       -5.0000  SKIP
     266       12.9000          ++
     267        4.5000
     268       10.2000
     266        3.1000          --

 MEAN =     10.238     SL =      2.200     N = 60


     269        9.1000
     270        7.0000
     271       10.4000          +
     272        8.5000
     273        5.5000
     274        7.2000
     275        8.8000
     276       11.0000          +
     277        9.3000
     278        7.5000
     279        7.9000
     280        9.4000
     281        6.7000
     282        6.9000
     283        9.1000
     284        7.8000
     285        8.5000
```

```
MEAN =      8.318    SD =      1.442    N = 17

--------------------------------------------------------------------------
PARAMETRIC STATISTICS.


SUMMARY

SAMPLE  N     MEAN          SD           SE

PRE     23      7.374        1.832        .382

IN      60     10.238        2.200        .284

POST    17      8.318        1.442        .350
---------------------------------------------------
SUM    100      9.253        2.350        .235


ANALYSIS OF VARIANCE TABLE.

       DF      SS          MS     F
      ----    ----        ----   ---
TREAT   2     154.3       77.2  19.070

ERROR  97     392.5        4.0  ---
-----------------------------------------------
TOTAL  99     546.9        5.5  ---

 19.070 IS SIGNIFICANT AT THE    .1 PERCENT LEVEL

CONTRAST   F

PRE-IN     23.317 IS SIGNIFICANT AT THE    .1 PERCENT LEVEL.

IN-POST    10.484 IS SIGNIFICANT AT THE    .2 PERCENT LEVEL.

PRE-POST    2.531 IS SIGNIFICANT AT THE  11.5 PERCENT LEVEL.


--------------------------------------------------------------------------
NON-PARAMETRIC STATISTICS.

        I          OBSERVATIONS        SAMPLE        SCORES
        1              3.1               2              -99.
        2              4.5               2              -97.
        3              5.0               1              -95.
        4              5.5               3              -93.
        5              5.6               1              -91.
        6              5.7               1              -89.
        7              5.9               1              -87.
        8              6.0               1              -85.
        9              6.2               1              -82.
       10              6.2               1              -82.
       11              6.6               2              -79.
       12              6.7               1              -75.
       13              6.7               1              -75.
       14              6.7               3              -75.
       15              6.8               1              -70.
```

16	6.8	1	-70.
17	6.9	3	-67.
18	7.0	3	-65.
19	7.1	1	-63.
20	7.2	3	-61.
21	7.4	1	-59.
22	7.5	1	-56.
23	7.5	3	-56.
24	7.7	1	-53.
25	7.8	3	-48.
26	7.8	1	-48.
27	7.8	1	-48.
28	7.8	2	-48.
29	7.9	3	-42.
30	7.9	2	-42.
31	8.0	1	-39.
32	8.2	1	-36.
33	8.2	1	-36.
34	8.3	2	-33.
35	8.4	2	-31.
36	8.5	3	-29.
37	8.6	2	-26.
38	8.6	2	-26.
39	8.7	1	-23.
40	8.8	2	-18.
41	8.8	2	-18.
42	8.8	3	-18.
43	8.8	3	-18.
44	9.1	2	-8.
45	9.1	3	-8.
46	9.1	2	-8.
47	9.1	2	-8.
48	9.1	2	-8.
49	9.1	3	-8.
50	9.2	2	0.
51	9.2	2	0.
52	9.4	3	4.
53	9.4	2	4.
54	9.5	1	8.
55	9.5	2	8.
56	9.6	2	11.
57	9.7	2	13.
58	9.8	2	17.
59	9.8	3	17.
60	9.8	2	17.
61	10.0	2	22.
62	10.0	2	22.
63	10.1	2	25.
64	10.2	2	28.
65	10.2	2	28.
66	10.3	2	33.
67	10.3	2	33.
68	10.3	2	33.
69	10.4	2	39.
70	10.4	3	39.
71	10.4	2	39.
72	10.5	2	45.
73	10.5	2	45.
74	10.5	2	45.
75	10.7	2	50.

```
        76              10.7                    2                   50.
        77              10.8                    2                   54.
        78              10.8                    2                   54.
        79              10.9                    2                   58.
        80              10.9                    2                   58.
        81              11.0                    2                   63.
        82              11.0                    2                   63.
        83              11.0                    3                   63.
        84              11.1                    2                   67.
        85              11.2                    2                   69.
        86              11.4                    2                   71.
        87              11.5                    2                   73.
        88              11.6                    2                   75.
        89              11.7                    2                   77.
        90              11.8                    2                   81.
        91              11.8                    2                   81.
        92              11.8                    2                   81.
        93              11.9                    2                   85.
        94              12.0                    2                   87.
        95              12.3                    2                   89.
        96              12.7                    2                   91.
        97              12.9                    2                   93.
        98              14.1                    1                   95.
        99              14.3                    2                   97.
       100              19.8                    2                   99.


   SAMPLE           W(I)            N(I)
      1            -1259.           23.
      2             1724.           60.
      3            -465.            17.

   B =    131171.95       T =    333106.

   WSCORE =   38.985

    38.985 IS SIGNIFICANT WITH PROBABILITY LESS THAN     .100 PERCENT LEVEL


   CONTRAST PRE-IN

         I            OBSERVATIONS           SAMPLE          SCORES
         1                3.1                   2               -82.
         2                4.5                   2               -80.
         3                5.0                   1               -78.
         4                5.6                   1               -76.
         5                5.7                   1               -74.
         6                5.9                   1               -72.
         7                6.0                   1               -70.
         8                6.2                   1               -67.
         9                6.2                   1               -67.
        10                6.6                   2               -64.
        11                6.7                   1               -61.
        12                6.7                   1               -61.
        13                6.8                   1               -57.
        14                6.8                   1               -57.
        15                7.1                   1               -54.
        16                7.4                   1               -52.
```

51

17	7.5	1	-50.
18	7.7	1	-48.
19	7.8	2	-44.
20	7.8	1	-44.
21	7.8	1	-44.
22	7.9	2	-40.
23	8.0	1	-38.
24	8.2	1	-35.
25	8.2	1	-35.
26	8.3	2	-32.
27	8.4	2	-30.
28	8.6	2	-27.
29	8.6	2	-27.
30	8.7	1	-24.
31	8.8	2	-21.
32	8.8	2	-21.
33	9.1	2	-15.
34	9.1	2	-15.
35	9.1	2	-15.
36	9.1	2	-15.
37	9.2	2	-9.
38	9.2	2	-9.
39	9.4	2	-6.
40	9.5	1	-3.
41	9.5	2	-3.
42	9.6	2	0.
43	9.7	2	2.
44	9.8	2	5.
45	9.8	2	5.
46	10.0	2	9.
47	10.0	2	9.
48	10.1	2	12.
49	10.2	2	15.
50	10.2	2	15.
51	10.3	2	20.
52	10.3	2	20.
53	10.3	2	20.
54	10.4	2	25.
55	10.4	2	25.
56	10.5	2	30.
57	10.5	2	30.
58	10.5	2	30.
59	10.7	2	35.
60	10.7	2	35.
61	10.8	2	39.
62	10.8	2	39.
63	10.9	2	43.
64	10.9	2	43.
65	11.0	2	47.
66	11.0	2	47.
67	11.1	2	50.
68	11.2	2	52.
69	11.4	2	54.
70	11.5	2	56.
71	11.6	2	58.
72	11.7	2	60.
73	11.8	2	64.
74	11.8	2	64.
75	11.8	2	64.
76	11.9	2	68.

```
      77              12.0                2                70.
      78              12.3                2                72.
      79              12.7                2                74.
      80              12.9                2                76.
      81              14.1                1                78.
      82              14.3                2                80.
      83              19.8                2                82.


   W         ST. DEV.    ASYMPTOTIC
                           WSCORE
   -1089.   196.53        -5.54
-5.54 IS SIGNIFICANT AT THE      .2 PERCENT LEVEL -TWO TAILED TEST
-5.54 IS SIGNIFICANT AT THE      .1 PERCENT LEVEL -ONF TAILED TEST



CONTRAST IN-POST

       I          OBSERVATIONS        SAMPLE        SCORES
       1              3.1               2             -76.
       2              4.5               2             -74.
       3              5.5               3             -72.
       4              6.6               2             -70.
       5              6.7               3             -68.
       6              6.9               3             -66.
       7              7.0               3             -64.
       8              7.2               3             -62.
       9              7.5               3             -60.
      10              7.8               3             -57.
      11              7.8               2             -57.
      12              7.9               3             -53.
      13              7.9               2             -53.
      14              8.3               2             -50.
      15              8.4               2             -48.
      16              8.5               3             -46.
      17              8.6               2             -43.
      18              8.6               2             -43.
      19              8.8               3             -37.
      20              8.8               2             -37.
      21              8.8               3             -37.
      22              8.8               2             -37.
      23              9.1               2             -27.
      24              9.1               2             -27.
      25              9.1               2             -27.
      26              9.1               3             -27.
      27              9.1               2             -27.
      28              9.1               3             -27.
      29              9.2               2             -19.
      30              9.2               2             -19.
      31              9.4               3             -15.
      32              9.4               2             -15.
      33              9.5               2             -12.
      34              9.6               2             -10.
      35              9.7               2              -8.
      36              9.8               2              -4.
      37              9.8               3              -4.
      38           9.8                 2               -4.
      39          10.0                 2                1.
      40          10.0                 2                1.
      41          10.1                 2                4.
      42          10.2                 2                7.
      43          10.2                 2                7.
      44          10.3                 2               12.
      45          10.3                 2               12.
      46          10.3                 2               12.
      47          10.4                 2               18.
      48          10.4                 2               18.
      49          10.4                 3               18.
      50          10.5                 2               24.
      51          10.5                 2               24.
      52          10.5                 2               24.
      53          10.7                 2               29.
      54          10.7                 2               29.
      55          10.6                 2               33.
      56          10.8                 2               33.
      57          10.9                 2               37.
      58          10.9                 2               37.
      59          11.0                 2               42.
      60          11.0                 3               42.
      61          11.0                 2               42.
      62          11.1                 2               46.
      63          11.2                 2               48.
      64          11.4                 2               50.
      65          11.5                 2               52.
      66          11.6                 2               54.
      67          11.7                 2               56.
      68          11.8                 2               60.
      69          11.8                 2               60.
      70          11.8                 2               60.
      71          11.9                 2               64.
      72          12.0                 2               66.
      73          12.3                 2               68.
      74          12.7                 2               70.
      75          12.9                 2               72.
      76          14.3                 2               74.
      77          19.8                 2               76.


  W       ST. DEV.    ASYMPTOTIC
                        WSCORE
   635.  162.77          3.90
3.90 IS SIGNIFICANT AT THE       .2 PERCENT LEVEL -TWO TAILED TEST
3.90 IS SIGNIFICANT AT THE       .1 PERCENT LEVEL -ONE TAILED TEST



CONTRAST PRE-POST

       I           OBSERVATIONS         SAMPLE          SCORES
       1              5.0                 1               -39.
       2              5.5                 3               -37.
       3              5.6                 1               -35.
       4              5.7                 1               -33.
      5            5.9              1            -31.
      6            6.0              1            -29.
      7            6.2              1            -26.
      8            6.2              1            -26.
      9            6.7              1            -21.
     10            6.7              3            -21.
     11            6.7              1            -21.
     12            6.8              1            -16.
     13            6.8              1            -16.
     14            6.9              3            -13.
     15            7.0              3            -11.
     16            7.1              1             -9.
     17            7.2              3             -7.
     18            7.4              1             -5.
     19            7.5              1             -2.
     20            7.5              3             -2.
     21            7.7              1              1.
     22            7.8              1              5.
     23            7.8              1              5.
     24            7.8              3              5.
     25            7.9              3              9.
     26            8.0              1             11.
     27            8.2              1             14.
     28            8.2              1             14.
     29            8.5              3             17.
     30            8.7              1             19.
     31            8.8              3             22.
     32            8.8              3             22.
     33            9.1              3             26.
     34            9.1              3             26.
     35            9.4              3             29.
     36            9.5              1             31.
     37            9.8              3             33.
     38           10.4              3             35.
     39           11.0              3             37.
     40           14.1              1             39.


  W        ST. DEV.    ASYMPTOTIC
                         WSCORE
  -170.    73.05         -2.31
-2.31 IS SIGNIFICANT AT THE     2.1 PERCENT LEVEL -TWO TAILED TEST
-2.31 IS SIGNIFICANT AT THE     1.0 PERCENT LEVEL -ONE TAILED TEST
```

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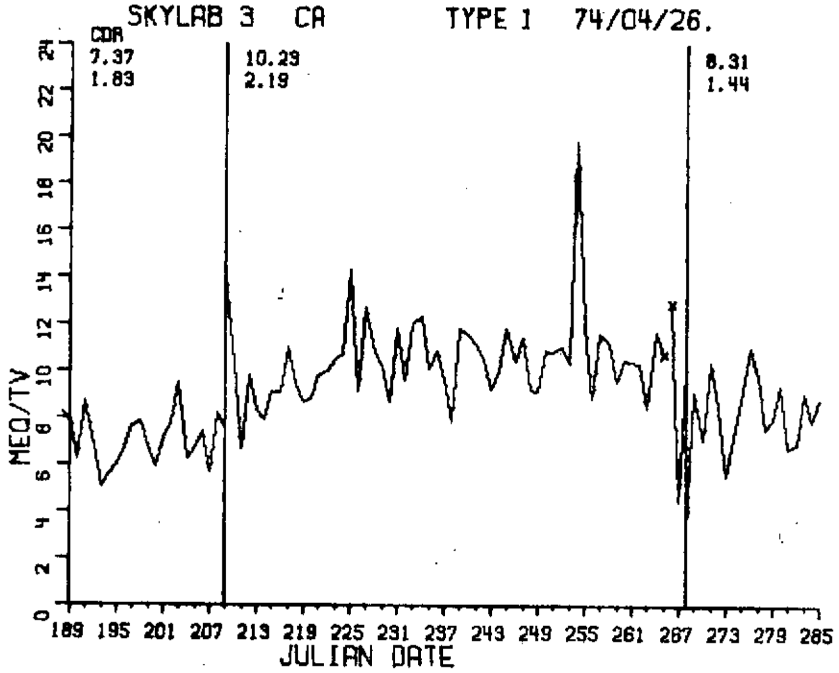
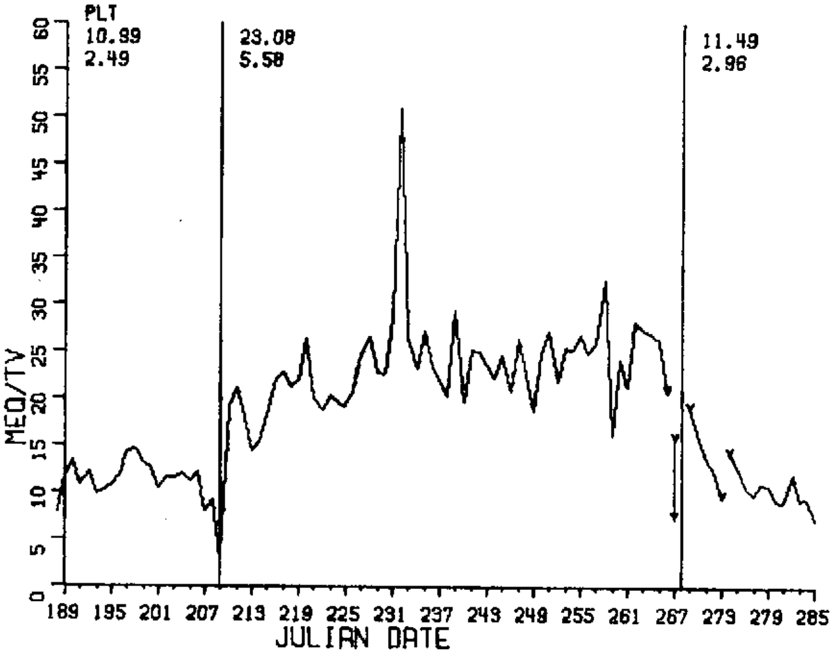
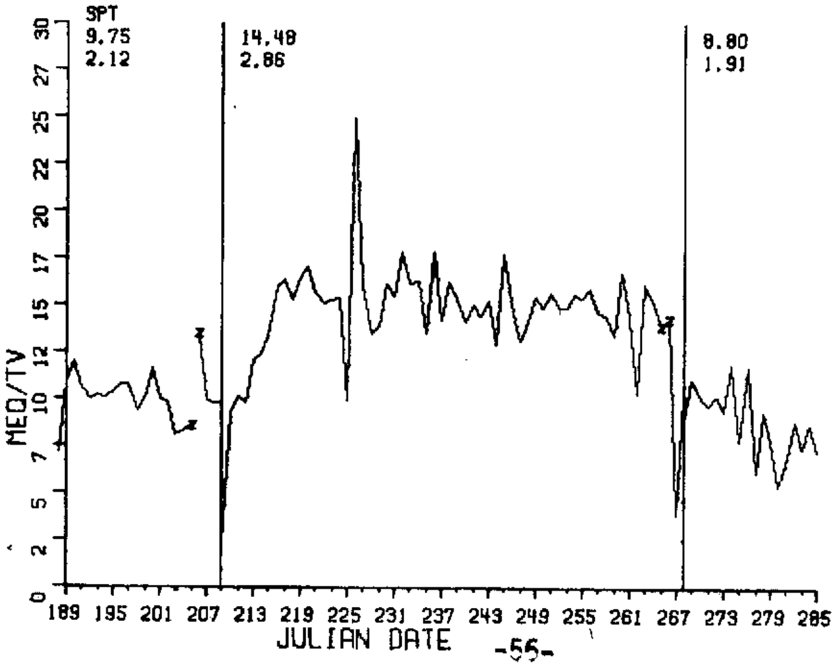
SKYLAB 3 CA TYPE 1 74/04/26.







APPENDIX D - Examples of Program Modifications

D.1 Program BUILD for creating and updating the data files as described in Sections 3 and 4

```
      PROGRAM BUILD(INPUT,OUTPUT,TAPE1=INPUT)                                BUILD
C RA1=SAMPLE DIRECTORY   ***  RA2=URINE FILE   ***  RA3=BLOOD FILE            BUILD
C                        ***  RA4=DAILY FILE   ***                            BUILD
                                                                              BUILD
      EXTERNAL ERROR1                                                         BUILD
      EXTERNAL ERROR2                                                         BUILD
      EXTERNAL ERROR3                                                         BUILD
      EXTERNAL ERROR4                                                         BUILD
      COMMON     FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)                  BUILD
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,            BUILD
     +                INITIAL,ICODE                                           BUILD
      DIMENSION INDX(136),INDX1(136),INDX2(136),INDX3(136),                   BUILD
     . INDX4(136),INDX5(136)                                                  BUILD
      DIMENSION KARD( 8), ITEMP(35), IUDATE(4), XTEMP(35)                     BUILD
      INTEGER KEY(2), KYE(3)                                                  BUILD
      EQUIVALENCE (ITEMP(1),XTEMP(1))                                         BUILD
      EQUIVALENCE (IUDATE(4),XUDATE)                                          BUILD
      EQUIVALENCE (KEE,KEY(2)),(KEF,KYE(3))                                   BUILD
      DATA ICDT/445B/                                                         BUILD
      DATA(INDX(I),I=1,136)/400,401,402,403,404,405,503,406,407,408,409,BUILD
                                                                              BUILD
     . 410,
     1 411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,BUILD
     2 427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,BUILD
     3 443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,BUILD
     4 459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,BUILD
     5 475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,BUILD
     6 491,492,493,494,495,496,497,498,499,500,501,502,300,301,302,303,BUILD
     7 304,305,306,307,321,308,309,310,311,312,313,314,315,316,317,318,BUILD
     . 319,                                                                   BUILD
     8 320,514,515,516,517,518,519,520,521,522,523/                           BUILD
      DATA(INDX1(I),I=1,136)/104*1RU,22*1RB,10*1RU/                           BUILD
      DATA (INDX2(I),I=1, 70)/          8HEPI     ,8HNOREPI  ,8HADH     ,BUILD
     .8HHYDRO   ,8HALDO    ,8H17OH    ,8H5HIAA   ,8HOSMO    ,8HNA      ,BUILD
     . 8HK      ,                                                         BUILD
     .8HMG      ,8HPO4     ,8HCA      ,8HCL      ,8HH       ,8HSP.GR.  ,BUILD
     .8HCREAT   ,8HURICACID,8HB       ,8HSI      ,8HFE      ,8HAL      ,BUILD
     .8HMO      ,8HCU      ,8HZN      ,8HTI      ,8HNI      ,8HSR      ,BUILD
     .8HCR      ,8HBL      ,8HMN      ,8HLI      ,8HRB      ,8HPD      ,BUILD
     .8HAND     ,8HETIO    ,8HDHEA    ,8H11=OANL ,8H11=OETIO,8H11OHAND ,BUILD
     .8H11OHETIO,8HTOTAL MG,8HLYS     ,8HHIS     ,8HNH3     ,8HARG     ,BUILD
     .8HHYP     ,8HASP     ,8HTHR     ,8HSER     ,8HGLU     ,8HPRO     ,BUILD
     .8HGLY     ,8HALA     ,8HCYS/2   ,8HVAL     ,8HMET     ,8HILE     ,BUILD
     .8HLEU     ,8HTYR     ,8HPHE     ,8HHLYS    ,8HGAMMA-AB,8HORN     ,BUILD
     .8HETH     ,8HNH3     ,8HLYS     ,8H1-CH-HIS,8HHIS     ,8H3-CH-HIS/BUILD
                                                                              BUILD
      DATA (INDX2(I),I=71,126)/
     .8HANS     ,8HTRY     ,8HCRE     ,8HCAR     ,8HARG     ,8HPSER    ,BUILD
     .8HPETN    ,8HTAR     ,8HUREA    ,8HHYP     ,8HASP     ,8HTHR     ,BUILD
     .8HSER     ,8HASPNH2  ,8HGLUNH2  ,8HSAR     ,8HPRO     ,8HGLU     ,BUILD
     .8HCIT     ,8HGLCNH2  ,8HGLY     ,8HALA     ,8HALPHA-AA,8HALPHA-AB,BUILD
     .8HVAL     ,8HCYS/2   ,8HCYT     ,8HMET     ,8HILF     ,8HLEU     ,BUILD
     .8HTYR     ,8HPHE     ,8HBETA-ALA,8HBETA-AIB,8HHYDRO   ,8HALDO    ,BUILD
     .8HHGH     ,8HANGIO   ,8HINSULIN ,8HT4      ,8HACTH    ,8HADH     ,BUILD
                                                                              BUILD
     . 8HTESTOS ,
     .8HPTH     ,8HCAL     ,8HVIT.D.  ,8HTSH     ,8HOSMO    ,8HNA      ,BUILD
     .8HK       ,8HMG      ,8HPO4     ,8HCA      ,8HCL      ,8HGLU     ,BUILD
     .8HTOTAL P   /                                                           BUILD
      DATA (INDX3(I),I=1,136)/2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,   BUILD
     1 18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,  BUILD
     2 39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,  BUILD
     3 60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,  BUILD
     4 81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,    BUILD
     5101,102,103,104,105,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,BUILD
     6  20,21,22,23,116,117,118,119,120,121,122,123,124,125/            BUILD
      DATA (INDX4(I),I=1,136) /7*1,11*4,15*6,9*7,4*8,15*9,14*10,        BUILD
     1  15*11,14*12,9*2,4*3,9*5,10*15/                                  BUILD
      DATA (INDX5(I),I=1,136) /3,4,5,6,7,8,9,3,4,5,6,7,8,9,10,11,12,13, BUILD
     1  3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,3,4,5,6,7,8,9,10,11,3,4,  BUILD
     2  5,6,3,4,                                                        BUILD
     3  5,6,7,8,9,10,11,12,13,14,15,16,17,3,4,5,6,7,8,9,10,11,12,13,    BUILD
     4  14,15,16,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,3,4,5,6,7,8,9,   BUILD
     5  10,11,12,13,14,15,16,3,4,5,6,7,8,9,10,11,3,4,5,6, 3,4,5,6,7,8,9,BUILD
     6  10,11,3,4,5,6,7,8,9,10,11,12/                                   BUILD
                                                                        BUILD
C                                                                       BUILD
C                                                                       BUILD
      IERR = 0                                                          BUILD
C     SET INITIAL 1 FOR EXISTING FILES  0 FOR NEW FILES                 BUILD
      INITIAL = 0                                                       BUILD
      CALL FILEIS(FITRA1,3LLFN,3LRA1,3LWSA, IBUF,2LRL, 350,2LKA,KEE,    BUILD
     +                     2LKP,0,2LKL,10,2LKT,1LI)                     BUILD
      CALL FILEIS(FITRA2,3LLFN,3LRA2,3LWSA,  IUR,2LRL,1250,2LKA,KEE,    BUILD
     +                     2LKP,0,2LKL,10,2LKT,1LI)                     BUILD
      CALL FILEIS(FITRA3,3LLFN,3LRA3,3LWSA,  IBL,2LRL, 350,2LKA,KEE,    BUILD
     +                     2LKP,0,2LKL,10,2LKT,1LI)                     BUILD
      CALL FILEIS(FITRA4,3LLFN,3LRA4,3LWSA,IBUFF,2LRL, 300,2LKA,KEF,    BUILD
     +                     2LKP,0,2LKL,10,2LKT,1LI)                     BUILD
      CALL STOREF(FITRA1,3LFRL,0)                                       BUILD
      CALL STOREF(FITRA2,3LERL,0)                                       BUILD
      CALL STOREF(FITRA3,3LFRL,0)                                       BUILD
      CALL STOREF(FITRA4,3LFRL,0)                                       BUILD
      CALL STOREF(FITRA1,2LEX,ERROR1)                                   BUILD
      CALL STOREF(FITRA2,2LEX,ERROR2)                                   BUILD
      CALL STOREF(FITRA3,2LEX,ERROR3)                                   BUILD
      CALL STOREF(FITRA4,2LEX,ERROR4)                                   BUILD
      IF(INITIAL.EQ.1) GO TO 106                                        BUILD
C     CALL RANDOM(0,@RA1@,35,5,7,100S,100S,ICODE,LOC)                   BUILD
C     CALL RANDOM(0,@RA2@,125,5,7,100S,100S,ICODE,LOC)                  BUILD
C     CALL RANDOM(0,@RA3@,32,5,7,100S,100S,ICODE,LOC)                   BUILD
C     CALL RANDOM(0,@RA4@,30,5,11,100S,100S,ICODE,LOC)                  BUILD
      CALL STOREF(FITRA1,2LRB,5)                                        BUILD
      CALL STOREF(FITRA2,2LRB,5)                                        BUILD
      CALL STOREF(FITRA3,2LRB,5)                                        BUILD
      CALL STOREF(FITRA4,2LRB,5)                                        BUILD
      CALL STOREF(FITRA1,3LMNR, 350)                                    BUILD
      CALL STOREF(FITRA2,3LMNR,1250)                                    BUILD
      CALL STOREF(FITRA3,3LMNR, 350)                                    BUILD
      CALL STOREF(FITRA4,3LMNR, 300)                                    BUILD
      CALL STOREF(FITRA1,3LMRL, 350)                                    BUILD
      CALL STOREF(FITRA2,3LMRL,1250)                                    BUILD
      CALL STOREF(FITRA3,3LMRL, 350)                                    BUILD
      CALL STOREF(FITRA4,3LMRL, 300)                                    BUILD
      CALL OPENM(FITRA1,3LNEW)                                          BUILD
      CALL OPENM(FITRA2,3LNEW)                                          BUILD
      CALL OPENM(FITRA3,3LNEW)                                          BUILD
      CALL OPENM(FITRA4,3LNEW)                                          BUILD
      GO TO 40                                                          BUILD
  106 CONTINUE                                                          BUILD
C 106 CALL RANDOM(4,@RA1@,35,5,7,100S,100S,ICODE,LOC)                   BUILD
C     CALL RANDOM(4,@RA2@,125,5,7,100S,100S,ICODE,LOC)                  BUILD
C     CALL RANDOM(4,@RA3@,32,5,7,100S,100S,ICODE,LOC)                   BUILD
C     CALL RANDOM(4,@RA4@,30,5,11,100S,100S,ICOLE,LOC)                  BUILD
      CALL OPENM(FITRA1,3LI-O)                                          BUILD
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                                                                        BUILD
      CALL OPENM(FITRA2,3LI-0)                                          BUILD
      CALL OPENM(FITRA3,3LI-0)                                          BUILD
      CALL OPENM(FITRA4,3LI-0)                                          BUILD
   40 DO 30 I=1,35                                                      BUILD
   30 ITEMP(I)=0                                                        BUILD
      ICODE = 0                                                         BUILD
      IF(INITIAL.EQ.0) ICODE = ICDT                                     BUILD
      READ(1,105) IFORM,KARD                                            BUILD
  105 FORMAT(I2,7A10,A8)                                                BUILD
      IF(EOF(1).NE.0) GO TO 99                                          BUILD
      IF(IFORM.EQ. 0) GO TO 1000                                        BUILD
      IF(IFORM.EQ.99) GO TO 99                                          BUILD
      IF(IFORM.EQ.98) GO TO 98                                          BUILD
      GO TO(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15),IFORM                  BUILD
C                                                                       BUILD
C SAMPLE DIRECTORY CARD                                                 BUILD
 1000 IEND=24                                                           BUILD
      DECODE(80,115,KARD) (ITEMP(I),I=1,12),XTEMP(13),(ITEMP(I),I=14,24)BUILD
  115 FORMAT(I4,I1,I3,I1,I2,I4,3I2,I4,I3,I5,F4.1,I4,9A4,A1)             BUILD
      GO TO 35                                                          BUILD
C     DELETE A RECORD WITH KEY AND FILE NUMBER                          BUILD
C     FFKKKKF                                                           BUILD
   98 DECODE(6,198,KARD) ITEMP(1),ITEMP(2)                              BUILD
  198 FORMAT(I4,I1)                                                     BUILD
      KEE=ITEMP(1)                                                      BUILD
      ICODE=0                                                           BUILD
      GO TO (801,802,803,804),ITEMP(2)                                  BUILD
  801 CALL DLTE(FITRA1)                                                 BUILD
      GO TO 808                                                         BUILD
  802 CALL DLTE(FITRA2)                                                 BUILD
      GO TO 808                                                         BUILD
  803 CALL DLTE(FITRA3)                                                 BUILD
      GO TO 808                                                         BUILD
  804 KLF=ITEMP(1)                                                      BUILD
      CALL DLTE(FITRA4)                                                 BUILD
  808 IF(ICODE.EQ.0) GO TO 40                                           BUILD
      PRINT 298,ITEMP(1),ITEMP(2)                                       BUILD
  298 FORMAT(* ERROR ON DELETION - KEY * I10,* FILE *,I10)              BUILD
      GO TO 310                                                         BUILD
C                                                                       BUILD
C URINE HORMONES CARD                                                   BUILD
C                                                                       BUILD
    1 IEND=8                                                            BUILD
      K=2                                                               BUILD
      DECODE(80,16,KARD) ITEMP(1),(XTEMP(I),I=2,8)                      BUILD
   16 FORMAT(I4,5F4.1,2F3.1)                                            BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C PLASMA HORMONES SHORT TERM CARD                                       BUILD
C                                                                       BUILD
    2 IEND = 10                                                         BUILD
      K=2                                                               BUILD
      DECODE(80,17,KARD) ITEMP(1),(XTEMP(I),I=2,10)                     BUILD
   17 FORMAT(I4,2F4.1,F3.1,F4.2,F4.1,F3.1,F4.1,F5.2,F5.1)               BUILD
      GO TO 50                                                          BUILD
C                                                                       BUILD
C PLASMA HORMONES LONG TERM CARD                                        BUILD
C                                                                       BUILD
    3 IEND=5                                                            BUILD
      K=11
      DECODE(80,18,KARD) ITEMP(1),(XTEMP(I),I=2,5)                      BUILD
   18 FORMAT(I4,F5.1,3F4.1)                                             BUILD
      GO TO 50                                                          BUILD
C                                                                       BUILD
C URINE CHEMISTRIES CARD                                                BUILD
C                                                                       BUILD
    4 IEND=12                                                           BUILD
      K=9                                                               BUILD
      DECODE(80,19,KARD) ITEMP(1),(XTEMP(I),I=2,12)                     BUILD
   19 FORMAT(I4,3F4.0,F4.1,F4.0,F3.1,F4.0,F5.1,F4.3,2F4.0)              BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C BLOOD CHEMISTRIES CARD                                                BUILD
C                                                                       BUILD
    5 IEND=10                                                           BUILD
      K=15                                                              BUILD
      DECODE(80,20,KARD) ITEMP(1),(XTEMP(I),I=2,10)                     BUILD
   20 FORMAT(I4,2F4.1,4F3.1,F3.0,F4.0,F3.1)                             BUILD
      GO TO 50                                                          BUILD
C                                                                       BUILD
C TRACE METALS CARD                                                     BUILD
C                                                                       BUILD
    6 IEND=16                                                           BUILD
      K=20                                                              BUILD
      DECODE(80,21,KARD) ITEMP(1),(XTEMP(I),I=2,16)                     BUILD
   21 FORMAT(I4,2F4.2,F4.3,F4.2,F4.4,F4.3,F4.2,F4.3,F4.4,F4.3,          BUILD
     .       F4.4,F4.3,F4.4,F6.4,F5.4)                                  BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C 17KETO STEROIDS CARD                                                  BUILD
C                                                                       BUILD
    7 IEND=10                                                           BUILD
      K=35                                                              BUILD
      DECODE(80,22,KARD) ITEMP(1),(XTEMP(I),I=2,10)                     BUILD
   22 FORMAT(I4,8F5.3,F4.2)                                             BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C TOTAL AMINO ACIDS BASIC CARD                                          BUILD
C                                                                       BUILD
    8 IEND=5                                                            BUILD
      K=44                                                              BUILD
      DECODE(80,23,KARD) ITEMP(1),(XTEMP(I),I=2,5)                      BUILD
   23 FORMAT(I4,4F5.2)                                                  BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C TOTAL AMINO ACIDS ACID AND NEUTRAL CARD                               BUILD
C                                                                       BUILD
    9 IEND=16                                                           BUILD
      K=48                                                              BUILD
      DECODE(80,24,KARD) ITEMP(1),(XTEMP(I),I=2,16)                     BUILD
   24 FORMAT(I4,F4.2,4F5.2,F4.2,F6.2,3F5.2,F4.2,2F5.2, 2F4.2)           BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C FREE AMINO ACIDS BASIC CARD                                           BUILD
C                                                                       BUILD
   10 IEND=15                                                           BUILD
      K=63                                                              BUILD
      DECODE(80,25,KARD) ITEMP(1),(XTEMP(I),I=2,15)                     BUILD
   25 FORMAT(I4,F5.2,2F4.2,F6.2,  2F5.2,3F6.2,F4.2,F5.2,F7.2,2F4.2)     BUILD
      GO TO 60                                                          BUILD
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C                                                                       BUILD
C FREE AMINO ACIDS ACID AND NEUTRAL CARD 1                              BUILD
C                                                                       BUILD
   11 IEND=16                                                           BUILD
      K=77                                                              BUILD
      DECODE(80,26,KARD) ITEMP(1),(XTEMP(I),I=2,16)                     BUILD
   26 FORMAT(I4,2F5.2,F6.2,F5.2,F4.2,4F5.2,F6.2,3F5.2,2F4.2)            BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C FREE AMINO ACIDS ACID AND NEUTRAL CARD 2                              BUILD
C                                                                       BUILD
   12 IEND=15                                                           BUILD
      K=92                                                              BUILD
      DECODE(80,27,KARD) ITEMP(1),(XTEMP(I),I=2,15)                     BUILD
   27 FORMAT(I4,F6.2,13F5.2)                                            BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C DAILY PARAMETERS CARD                                                 BUILD
C                                                                       BUILD
   13 IEND = 20                                                         BUILD
      DECODE(80,28,KARD) ITEMP(1),ITEMP(2),(XTEMP(I),I=3,8),            BUILD
     .                   (ITEMP(I),I=9,20)                              BUILD
   28 FORMAT(I1,I3,3F5.2,3F4.0,11A4,A3)                                 BUILD
      GO TO 70                                                          BUILD
C                                                                       BUILD
C UPDATE CARD                                                           BUILD
C                                                                       BUILD
   14 DECODE(80,29,KARD) (IUDATE(I),I=1,3),XUDATE,ISTY                  BUILD
   29 FORMAT(I4,I2,I2,F15.7,I1)                                         BUILD
      GO TO 80                                                          BUILD
C                                                                       BUILD
C DIET PARAMETER CARDS                                                  BUILD
C                                                                       BUILD
   15 IEND = 11                                                         BUILD
      K = 116                                                           BUILD
      DECODE(80,215,KARD) ITEMP(1),(XTEMP(I),I=3,11),XTEMP(2)           BUILD
  215 FORMAT(I4,F4.0,F4.1,6F4.0,F5.2,F4.0)                              BUILD
      GO TO 60                                                          BUILD
C                                                                       BUILD
C PROCESS SAMPLE DIRECTORY CARDS                                        BUILD
C                                                                       BUILD
   35 KEY(2)=ITEMP(1)                                                   BUILD
      ITEMP(25)=1RU                                                     BUILD
      IF(ITEMP(4).GT.4.AND.ITEMP(4).LT.8.OR.ITEMP(4).EQ.9) ITEMP(25)=1RBBUILD
C     CALL RANDOM(1,@RA1@,IBUF,35,KEY,37S,37S,ICODE,LOC)                BUILD
      IF(ICODE.NE.0) GO TO 37                                           BUILD
      CALL GET(FITRA1)                                                  BUILD
      IF(ICODE.NE.0) GO TO 37                                           BUILD
      PRINT 34,KEY(2)                                                   BUILD
   34 FORMAT(@ATTEMPT TO ADD EXISTING SAMPLE NO. TO SAMPLE DIR.@,I4)    BUILD
      GO TO 310                                                         BUILD
C     STOP 1                                                            BUILD
   37 IF(ICODE.EQ.ICDT) GO TO 38                                        BUILD
   36 PRINT 39,ICODE,KEY(2)                                             BUILD
   39 FORMAT(@RA1 ERROR@,O8,5X,I4)                                      BUILD
      GO TO 310                                                         BUILD
C     STOP 2                                                            BUILD
   38 CONTINUE                                                          BUILD
C  38 CALL RANDOM(2,@RA1@,ITEMP,35,KEY,36S,36S,ICODE,LOC)               BUILD
      DO 33 I=1,35                                                      BUILD
      IBUF(I) = ITEMP(I)                                                BUILD
   33 CONTINUE                                                          BUILD
      IF(ICODE.EQ.0) GO TO 1033                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA1)                                                  BUILD
      GO TO 1034                                                        BUILD
 1033 CALL REPLC(FITRA1)                                                BUILD
 1034 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 36                                           BUILD
      GO TO 40                                                          BUILD
C                                                                       BUILD
C PROCESS BLOOD DATA CARDS                                              BUILD
C                                                                       BUILD
   50 KEY(2)=ITEMP(1)                                                   BUILD
C     CALL RANDOM(1,@RA3@,IBL,32,KEY,53S,53S,ICODE,LOC)                 BUILD
      IF(ICODE.NE.0) GO TO 53                                           BUILD
      CALL GET(FITRA3)                                                  BUILD
      IF(ICODE.NE.0) GO TO 53                                           BUILD
   51 DO 52 J=2,IEND                                                    BUILD
      IBL(K)=ITEMP(J)                                                   BUILD
   52 K=K+1                                                             BUILD
C     CALL RANDOM(2,@RA3@,IBL,32,KEY,55S,55S,ICODE,ILOC)                BUILD
      IF(ICODE.EQ.0) GO TO 1053                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA3)                                                  BUILD
      GO TO 1054                                                        BUILD
 1053 CALL REPLC(FITRA3)                                                BUILD
 1054 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 55                                           BUILD
      GO TO 40                                                          BUILD
   53 IF(ICODE.EQ.ICDT) GO TO 57                                        BUILD
   55 PRINT 54,ICODE,KEY(2)                                             BUILD
   54 FORMAT(@RA3 ERROR@,O8,5X,I4)                                      BUILD
      GO TO 310                                                         BUILD
C     STOP 3                                                            BUILD
   57 IBL(1)=ITEMP(1)                                                   BUILD
      DO 58 I=2,32                                                      BUILD
   58 IBL(I)=0                                                          BUILD
      GO TO 51                                                          BUILD
C                                                                       BUILD
C PROCESS URINE DATA CARDS                                              BUILD
C                                                                       BUILD
   60 KEY(2)=ITEMP(1)                                                   BUILD
C     CALL RANDOM(1,@RA2@,IUR,125,KEY,63S,63S,ICODE,LOC)                BUILD
      IF(ICODE.NE.0) GO TO 63                                           BUILD
      CALL GET(FITRA2)                                                  BUILD
      IF(ICODE.NE.0) GO TO 63                                           BUILD
   61 DO 62 J=2,IEND                                                    BUILD
      IUR(K)=ITEMP(J)                                                   BUILD
   62 K=K+1                                                             BUILD
C     CALL RANDOM(2,@RA2@,IUR,125,KEY,65S,65S,ICODE,LOC)                BUILD
      IF(ICODE.EQ.0) GO TO 1063                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA2)                                                  BUILD
      GO TO 1064                                                        BUILD
 1063 CALL REPLC(FITRA2)                                                BUILD
 1064 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 65                                           BUILD
      GO TO 40                                                          BUILD
   63 IF(ICODE.EQ.ICDT) GO TO 67                                        BUILD
   65 PRINT 64,ICODE,KEY(2)                                                   BUILD
   64 FORMAT(@RA2 ERROR@,O8,5X,I4)                                            BUILD
      GO TO 310                                                               BUILD
C     STOP 4                                                                  BUILD
   67 IUR(1)=ITEMP(1)                                                         BUILD
      DO 68 I=2,125                                                           BUILD
   68 IUR(I)=0                                                                BUILD
      GO TO 61                                                                BUILD
C                                                                             BUILD
C PROCESS DAILY PARAMETERS                                                    BUILD
C                                                                             BUILD
   70 DECODE(4,71,KARD) KYE(3)                                                BUILD
   71 FORMAT(I4)                                                              BUILD
C     CALL RANDOM(1,@RA4@,IBUF,30,KYE,77S,77S,ICODE,LOC)                      BUILD
      IF(ICODE.NE.0) GO TO 77                                                 BUILD
      CALL GET(FITRA4)                                                        BUILD
      IF(ICODE.NE.0) GO TO 77                                                 BUILD
      PRINT 75,KYE(2),KYE(3)                                                  BUILD
   75 FORMAT(1H1,@ATTEMPT TO ADD EXISTING DAY TO DAILY FILE@,I4,5X,I4)        BUILD
      GO TO 310                                                               BUILD
C     STOP 15                                                                 BUILD
   77 IF(ICODE.EQ.ICDT) GO TO 78                                              BUILD
   73 PRINT 74,ICODE,KYE(2),KYE(3)                                            BUILD
   74 FORMAT(1H1,@RA4 ERROR@,O8,5X,I4,5X,I4)                                  BUILD
      GO TO 310                                                               BUILD
C     STOP 5                                                                  BUILD
   78 CONTINUE                                                                BUILD
C  78 CALL RANDOM(2,@RA4@,ITEMP,30,KYE,73S,73S,ICODE,LOC)                     BUILD
      DO 79 I=1,30                                                            BUILD
      IBUFF(I) = ITEMP(I)                                                     BUILD
   79 CONTINUE                                                                BUILD
      IF(ICODE.EQ.0) GO TO 1073                                               BUILD
      ICODE = 0                                                               BUILD
      CALL PUT(FITRA4)                                                        BUILD
      GO TO 1074                                                              BUILD
 1073 CALL REPLC(FITRA4)                                                      BUILD
 1074 CONTINUE                                                                BUILD
      IF(ICODE.NE.0) GO TO 73                                                 BUILD
      GO TO 40                                                                BUILD
C                                                                             BUILD
C PROCESS UPDATE CARDS                                                        BUILD
C                                                                             BUILD
   80 IF(IUDATE(2).EQ.0) GO TO 200                                            BUILD
      IF(IUDATE(2).EQ.13) GO TO 220                                           BUILD
      DO 81 I=1,136                                                           BUILD
      IF(INDX4(I).EQ.IUDATE(2).AND.INDX5(I).EQ.IUDATE(3)) GO TO 83            BUILD
   81 CONTINUE                                                                BUILD
      PRINT 82,IFORM,(IUDATE(I),I=1,3),XUDATE                                 BUILD
   82 FORMAT(@NO UPDATE MATCH ON FORM AND FIELD@,5X,I2,5X,I4,2(5X,I2),        BUILD
     .  5X,F15.7)                                                             BUILD
      GO TO 310                                                               BUILD
C     STOP 6                                                                  BUILD
   83 IHIT=I                                                                  BUILD
      KEY(2)=IUDATE(1)                                                        BUILD
      IWRD=INDX3(IHIT)                                                        BUILD
      IF(INDX1(IHIT).EQ.1RR) GO TO 88                                         BUILD
C     CALL RANDOM(1,@RA2@,IUR,125,KEY,84S,84S,ICODE,LOC)                      BUILD
      IF(ICODE.NE.0) GO TO 84                                                 BUILD
      CALL GET(FITRA2)                                                        BUILD
      IF(ICODE.NE.0) GO TO 84                                                 BUILD
```

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OF POOR QUALITY

```
      IUR(IWRD)=IUDATE(4)                                               BUILD
C     CALL RANDOM(2,@RA2@,IUP,125,KEY,85S,85S,ICODE,LOC)                BUILD
      IF(ICODE.EQ.0) GO TO 1083                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA2)                                                  BUILD
      GO TO 1084                                                        BUILD
 1083 CALL REPLC(FITRA2)                                                BUILD
 1084 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 85                                           BUILD
      GO TO 40                                                          BUILD
   84 IF(ICODE.EQ.ICDT) GO TO 87                                        BUILD
   85 PRINT 86,ICODE,KEY(2)                                             BUILD
   86 FORMAT(@RA2 ERROR ON UPDATE@,O8,5X,I4)                            BUILD
      GO TO 310                                                         BUILD
C     STOP 7                                                            BUILD
   88 CONTINUE                                                          BUILD
C  88 CALL RANDOM(1,@RA3@,IBL,32,KEY,92S,92S,ICODE,LOC)                 BUILD
      IF(ICODE.NE.0) GO TO 92                                           BUILD
      CALL GET(FITRA3)                                                  BUILD
      IF(ICODE.NE.0) GO TO 92                                           BUILD
      IBL(IWRD)=IUDATE(4)                                               BUILD
C     CALL RANDOM(2,@RA3@,IBL,32,KEY,93S,93S,ICODE,LOC)                 BUILD
      IF(ICODE.EQ.0) GO TO 1093                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA3)                                                  BUILD
      GO TO 1094                                                        BUILD
 1093 CALL REPLC(FITRA3)                                                BUILD
 1094 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 93                                           BUILD
      GO TO 40                                                          BUILD
   92 IF(ICODE.EQ.ICDT) GO TO 87                                        BUILD
   93 PRINT 94,ICODE,KEY(2)                                             BUILD
   94 FORMAT(@RA3 ERROR ON UPDATE@,O8,5X,14)                            BUILD
      GO TO 310                                                         BUILD
C     STOP 8                                                            BUILD
   87 PRINT 95,ICODE,KEY(2),XUDATE                                      BUILD
   95 FORMAT(@RA2 OR RA3 SAMPLE NUMBER MISSING ON UPDATE@,              BUILD
     .       O8,5X,I4,3X,F15.7)                                         BUILD
      GO TO 310                                                         BUILD
C     STOP 9                                                            BUILD
  200 KEY(2) = IUDATE(1)                                                BUILD
      IHIT = IUDATE(3) - 1                                              BUILD
C     CALL RANDOM(1,@RA1@,ITEMP,35,KEY,216S,216S,ICODE,LOC)             BUILD
      IF(ICODE.NE.0) GO TO 216                                          BUILD
      CALL GET(FITRA1)                                                  BUILD
      IF(ICODE.NE.0) GO TO 216                                          BUILD
      IBUF(IHIT) = XUDATE                                               BUILD
      IF(IHIT.EQ.13) IBUF(IHIT) = IUDATE(4)                             BUILD
      IF(IHIT .EQ. 13) ITEMP(IHIT) = IUDATE(4)                          BUILD
C     CALL RANDOM(2,@RA1@,ITEMP,35,KEY,217S,217S,ICODE,LOC)             BUILD
      IF(ICODE.EQ.0) GO TO 1213                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA1)                                                  BUILD
      GO TO 1214                                                        BUILD
 1213 CALL REPLC(FITRA1)                                                BUILD
 1214 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 217                                          BUILD
      GO TO 40                                                          BUILD
  216 IF(ICODE.EQ.ICDT) GO TO 230                                       BUILD
  217 PRINT 218,ICODE,KEY(2)                                            BUILD
  218 FORMAT(@RA1 ERROR ON UPDATE@,08,5X,I4)                            BUILD
      GO TO 310                                                         BUILD
C     STOP 12                                                           BUILD
  220 KYE(3) = IUDATE(1) + 1000 * ISTY                                  BUILD
      IHIT = IUDATE(3) - 1                                              BUILD
C     CALL RANDOM(1,@RA4@,ITEMP,30,KYE,221S,221S,ICODE,LOC)             BUILD
      IF(ICODE.NE.0) GO TO 221                                          BUILD
      CALL GET(FITRA4)                                                  BUILD
      IF(ICODE.NE.0) GO TO 221                                          BUILD
      IBUFF(IHIT) = IUDATE(4)                                           BUILD
C     CALL RANDOM(2,@RA4@,ITEMP,30,KYE,222S,222S,ICODE,LOC)             BUILD
      IF(ICODE.EQ.0) GO TO 1223                                         BUILD
      ICODE = 0                                                         BUILD
      CALL PUT(FITRA4)                                                  BUILD
      GO TO 1224                                                        BUILD
 1223 CALL REPLC(FITRA4)                                                BUILD
 1224 CONTINUE                                                          BUILD
      IF(ICODE.NE.0) GO TO 222                                          BUILD
      GO TO 40                                                          BUILD
  221 IF(ICODE.EQ.ICDT) GO TO 240                                       BUILD
  222 PRINT 223,ICODE,KYE(2),KYE(3)                                     BUILD
  223 FORMAT(1H1,@RA4 ERROR ON UPDATE@,08,5X,I4,5X,I4)                  BUILD
      GO TO 310                                                         BUILD
C     STOP 13                                                           BUILD
  240 PRINT 241,ICODE,KYE(2),KYE(3),XUDATE                              BUILD
  241 FORMAT(@RA4 DAY AND STUDY MISSING ON UPDATE@,                     BUILD
     .           08,5X,I4,5X,I4,5X,F15.7)                               BUILD
      GO TO 310                                                         BUILD
C     STOP 14                                                           BUILD
  230 PRINT 231,ICODE,KEY(2),XUDATE                                     BUILD
  231 FORMAT(@RA1 SAMPLE NUMBER MISSING ON UPDATE@,08,5X,I4,5X,F15.7)   BUILD
      GO TO 310                                                         BUILD
C     STOP 16                                                           BUILD
C                                                                       BUILD
C CLOSE FILES AND SAVE                                                  BUILD
C                                                                       BUILD
   99 CONTINUE                                                          BUILD
C  99 CALL RANDOM(3,@RA1@)                                              BUILD
C     CALL RANDOM(3,@RA2@)                                              BUILD
C     CALL RANDOM(3,@RA3@)                                              BUILD
C     CALL RANDOM(3,@RA4@)                                              BUILD
      CALL CLOSEM(FITRA1)                                               BUILD
      CALL CLOSEM(FITRA2)                                               BUILD
      CALL CLOSEM(FITRA3)                                               BUILD
      CALL CLOSEM(FITRA4)                                               BUILD
      PRINT 300                                                         BUILD
  300 FORMAT(17H0UPDATE COMPLETE.)                                      BUILD
      STOP 10                                                           BUILD
  100 PRINT 101,ICODE, JCODE                                            BUILD
  101 FORMAT(@ OPEN OR UPDATE BEGIN ERROR@,5X,08,2X,08)                 BUILD
C     STOP 11                                                           BUILD
  310 PRINT 400,IFORM,KARD                                              BUILD
  400 FORMAT(I4,19A4,A2)                                                BUILD
      GO TO 40                                                          BUILD
      END                                                               BUILD
      SUBROUTINE ERROR1                                                 ERROR1
      COMMON    FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)             ERROR1
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,      ERROR1
     +                INITIAL,ICODE                                     ERROR1
      ICODE = IFETCH(FITRA1,3LIRS)                                      ERROR1
      CALL STOREF(FITRA1,3LIRS,0)                                       ERROR1
      IF(ICODE.EQ.0.OR.ICODF.EQ.445B) RETURN                            ERROR1
      PRINT 100,ICODE                                                   ERROR1
  100 FORMAT(*  RA1 ERROR*,O10)                                         ERROR1
      RETURN                                                            ERROR1
      END                                                               ERROR1
      SUBROUTINE ERROR2                                                 ERROR2
      COMMON     FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)            ERROR2
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,      ERROR2
     +                INITIAL,ICODE                                     ERROR2
      ICODE = IFETCH(FITRA2,3LIRS)                                      ERROR2
      CALL STOREF(FITRA2,3LIRS,0)                                       ERROR2
      IF(ICODE.EQ.0.OR.ICODF.EQ.445B) RETURN                            ERROR2
      PRINT 100,ICODE                                                   ERROR2
  100 FORMAT(*  RA2 ERROR*,O10)                                         ERROR2
      RETURN                                                            ERROR2
      END                                                               ERROR2
      SUBROUTINE ERROR3                                                 ERROR3
      COMMON     FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)            ERROR3
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,      ERROR3
     +                INITIAL,ICODE                                     ERROR3
      ICODE = IFETCH(FITRA3,3LIRS)                                      ERROR3
      CALL STOREF(FITRA3,3LIRS,0)                                       ERROR3
      IF(ICODE.EQ.0.OR.ICODF.EQ.445B) RETURN                            ERROR3
      PRINT 100,ICODE                                                   ERROR3
  100 FORMAT(*  RA3 ERROR*,O10)                                         ERROR3
      RETURN                                                            ERROR3
      END                                                               ERROR3
      SUBROUTINE ERROR4                                                 ERROR4
      COMMON     FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)            ERROR4
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,      ERROR4
     +                INITIAL,ICODE                                     ERROR4
      ICODE = IFETCH(FITRA4,3LIRS)                                      ERROR4
      CALL STOREF(FITRA4,3LIRS,0)                                       ERROR4
      IF(ICODE.EQ.0.OR.ICODE.EQ.445B) RETURN                            ERROR4
      PRINT 100,ICODE                                                   ERROR4
  100 FORMAT(*  RA4 ERROR*,O10)                                         ERROR4
      RETURN                                                            ERROR4
      END                                                               ERROR4
```

D.2 Program TYPLOK is used to determine the content and integrity of the data files See Sections 3 and 4

```
      PROGRAM TYPELOK(INPUT,OUTPUT)
      EXTERNAL ERROR
      COMMON FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35),IERR,IFILE
      COMMON UTYPE(125,5,5),BTYPE(25,4,5)
      COMMON MAN(3,125)
      INTEGER UTYPE,BTYPE,TYPE
      DIMENSION IBUF(35),XBUF(35),IBUF2(125),XBUF2(125)
      DIMENSION IBUF3(35),XBUF3(35)
      EQUIVALENCE (IBUF3(1),XBUF3(1))
      EQUIVALENCE(IBUF(1),XBUF(1)),(IBUF2(1),XBUF2(1))
      CALL FILEIS(FITRA1,3LLFN,3LRA1,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5
     +            ,3LMRL, 350,3LMNR, 350,3LWSA, IBUF)
      CALL STOREF(FITRA1,3LERL,0)
      CALL STOREF(FITRA1,2LEX,  ERROR)
      CALL OPENM(FITRA1,3LI-O)
      CALL REWND(FITRA1)
      CALL FILEIS(FITRA2,3LLFN,3LRA2,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5
     +            ,3LMRL,1250,3LMNR,1250,3LWSA,IBUF2)
      CALL STOREF(FITRA2,3LERL,0)
      CALL STOREF(FITRA2,2LEX,  ERROR)
      CALL OPENM(FITRA2,5LINPUT)
      CALL FILEIS(FITRA3,3LLFN,3LRA3,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5
     +            ,3LMRL, 350,3LMNR, 350,3LWSA, IBUF3)
      CALL STOREF(FITRA3,3LERL,0)
      CALL STOREF(FITRA3,2LEX,  ERROR)
      CALL OPENM(FITRA3,5LINPUT)
      DO 11 I=1,3
      DO 11 J=1,125
   11 MAN(I,J)=0
      DO 4 M=1,5
      DO 5 J=1,125
      DO 5 I=1,5
    5 UTYPE(J,I,M)=0
      DO 6 J=1,25
      DO 6 I=1,4
    6 BTYPE(J,I,M)=0
    4 CONTINUE
      KSAV=0
      ISTART=0
    9 IERR=0
      IFILE=1
      CALL GETN(FITRA1)
      IF(IFETCH(FITRA1,2LFP).EQ.100B) GO TO 40
      IF(IERR.NE.0) STOP 1
      IF(KEY.EQ.IBUF(1)) GO TO 10
      PRINT 601,KEY,IBUF(1)
  601 FORMAT(* MISMATCH KEY *,O20,1X,O20)
      GO TO 9
   10 IF(ISTART.NE.0) GO TO 20
      ISTART=1
      GO TO 21
   20 IF(KSAV +1.EQ.KEY) GO TO 22
   21 PRINT 602,KSAV,KSAV,KEY,KEY
  602 FORMAT(* KEY SEQUENCE - PREVIOUS *,O5,I5,* CURRENT *,O5,I5)
   22 KSAV=KEY
C     FIND WHICH RECORD AND FILE TO READ
      TYPE=IBUF(5)
      IF((IBUF(5).GE.1.AND.IBUF(5).LE.4).OR.IBUF(5).EQ.8) GO TO 25
      IF((IBUF(5).GE.5.AND.IBUF(5).LE.7).OR.IBUF(5).EQ.9) GO TO 35
      PRINT 603
  603 FORMAT(* INCORRECT TYPE - ASSUME URINE(RA2)*)
      PRINT 609,KEY,(IBUF(I),I=1,5)
  609 FORMAT(1H+,T40,*KEY=*,O5,* SAMPLE=*,I5,* STUDY=*,I2,* DATE=*,I4,*
     1MAN=*,I2,* TYPE=*,I2)
   25 CONTINUE
      MFLAG=0
      IERR=0
      IFILE=2
      CALL GET(FITRA2)
      IF(IERR.NE.0) GO TO 7
      IF(TYPE.LT.1.OR.TYPE.GT.9)GO TO 26
      IF(TYPE.EQ.8) TYPE=5
      M=IBUF(2)
      IF(M.GE.1.AND.M.LE.5) GO TO 12
      PRINT 703,(IBUF(I),I=1,5)
  703 FORMAT(* INCORRECT STUDY*,5I10)
      GO TO 26
   12 CONTINUE
C     PRIME CREW TEST
      IF(IBUF(4).GT.3) GO TO 26
      DO 3 I=2,125
C     USEABLE DATA TEST
      IF(XBUF2(I).EQ.0) GO TO 3
      IF(M. EQ.3) MAN(IBUF(4),I)=MAN(IBUF(4),I)+1
      IF(XBUF2(I).LT.0..AND.XBUF2(I).NE.-2.) GO TO 3
      UTYPE(I,TYPE,M)=UTYPE(I,TYPE,M)+1
    3 CONTINUE
      GO TO 26
    7 CONTINUE
      IF(IERR.EQ.445B) GO TO 27
      PRINT 604,IERR,KEY
  604 FORMAT(* RA2 ERROR *,O20,* KEY *,O20)
      GO TO 26
   27 PRINT 605
      PRINT 609,KEY,(IBUF(I),I=1,5)
      MFLAG=1
  605 FORMAT(* MISSING URINE RECORD *)
   26 IERR=0
      IFILE=3
      CALL GET(FITRA3)
      IF(IERR.EQ.445B) GO TO 9
      IF(IERR.NE.0) PRINT 606,IERR
  606 FORMAT(* ERROR ON RA3 AT 26 *,O20)
      PRINT 607,KEY,IBUF3(1),(XBUF3(I),I=2, 35)
  607 FORMAT(* BLOOD RECORD IN URINE TYPE *,O20,I5/4(4X,10F12.3/))
      IF(MFLAG.EQ.0) PRINT 620,KEY,IBUF2(1),(XBUF2(I),I=2,125)
  620 FORMAT(* URINE RECORD *,O20,I5/13(4X,10F12.3/))
      GO TO 9
   35 IERR=0
      IFILE=3
      MFLAG=0
      CALL GET(FITRA3)
      IF(IERR.NE.0) GO TO 8
      IF(TYPE.LT.1.OR.TYPE.GT.9) GOT O 36
      TYPE=IBUF(5)-4
      IF(TYPE.EQ.5) TYPE=4
      M=IBUF(2)
      IF(M.GE.1.AND.M.LE.5) GO TO 13
      PRINT 703,(IBUF(I),I=1,5)
      GO TO 36
   13 CONTINUE
C       PRIME CREW TEST
        IF(IBUF(4).GT.3) GO TO 36
        DO 2 I=2,25
C       USEABLE DATA TEST
        IF(XBUF3(I).EQ.0) GO TO 2
        IF(XBUF3(I).LT.0..AND.XBUF3(I).NE.-2.) GO TO 2
        BTYPE(I,TYPE,M)=BTYPE(I,TYPE,M)+1
    2 CONTINUE
        GO TO 36
    8 CONTINUE
        IF(IERR.EQ.445B) GO TO 37
        PRINT 614,IERR,KEY
  614 FORMAT(* RA3 ERROR *,O20,* KEY *,O20)
        GO TO 36
   37 PRINT 615
        PRINT 609,KEY,(IBUF(I),I=1,5)
  615 FORMAT(* MISSING BLOOD RECORD *)
        MFLAG=1
   36 IERR=0
        IFILE=2
        CALL GET(FITRA2)
        IF(IERR.EQ.445B) GO TO 9
        IF(IERR.NE.0) PRINT 616,IERR
  616 FORMAT(* ERROR ON RA2 AT 36 *,O20)
        PRINT 617,KEY,IBUF2(1),(XBUF2(I),I=2,125)
  617 FORMAT(* URINE RECORD IN BLOOD TYPE *,O20,I5/13(4X,10F12.3/))
        IF(MFLAG.EQ.0) PRINT 621,KEY,IBUF3(1),(XBUF3(I),I=2,35)
  621 FORMAT(* BLOOD RECORD *,O20,I5/4(4X,10F12.3/))
        GO TO 9
   40 CONTINUE
        PRINT 602,KEY,KEY
        CALL REWND(FITRA2)
   41 IERR=0
        IFILE=2
        CALL GETN(FITRA2)
        IF(IFETCH(FITRA2,2LFP).EQ.100B) GO TO 50
        IERR=0
        IFILE=1
        CALL GET(FITRA1)
        IF(IERR.EQ.445B) PRINT 618,KEY,KEY
  618 FORMAT(* MISSING RA1 RECORD FROM RA2 *,O20,I10)
        GO TO 41
   50 CALL REWND(FITRA3)
   51 IERR=0
        IFILE=3
        CALL GETN(FITRA3)
        IF(IFETCH(FITRA3,2LFP).EQ.100B) GO TO 60
        IERR=0
        IFILE=1
        CALL GET(FITRA1)
        IF(IERR.EQ.445B) PRINT 619,KEY,KEY
  619 FORMAT(* MISSING RA1 RECORD FROM RA3 *,O20,I10)
        GO TO 51
   60 CONTINUE
        PRINT 801,(I,I=1,5)
  801 FORMAT(1H1,T46,*URINE DATA SAMPLE COUNT*/T55,*STUDY*/T20,92(*-*)/
     15(20X,I2)/5(18X,*TYPE*)/5X,5(2X,20(*-*))/6X,5(*    1   2   3   4
     2 6 *)/* TEST*)
        DO 62 I=2,125
```

```
      K=I+398
      IF(I.EQ.8) K=503
      IF(I.GT.8.AND.I.LT.106) K=K-1
      PRINT 701,K,((UTYPE(I,J,M),J=1,5),M=1,5)
   62 CONTINUE
  701 FORMAT((I5,5(2X,5I4)))
      PRINT 610
  610 FORMAT(*1  COUNT OF URINE SAMPLE DATA POINTS BY MAN AND TEST*)
      PRINT 608,MAN
  608 FORMAT(3I5,2X,3I5,2X,3I5,2X,3I5,2X,3I5)
      PRINT 802,(I,I=1,5)
  802 FORMAT(1H1,T44,*BLOOD DATA SAMPLE COUNT*/T53,*STUDY*/T17,76(*-*)/
     15(16X,I2)/5(14X,*TYPE*)/5X,5(2X,16(*-*))/6X,5(*    5   6   7   9 *
     2)/* TEST*)
      DO 61 I=2,25
      K=I+298
      IF(I.EQ.10) K=321
      IF(I.GT.10.AND.I.LT.24) K=K-1
      PRINT 702,K,((BTYPE(I,J,M),J=1,4),M=1,5)
   61 CONTINUE
  702 FORMAT((I5,5(2X,4I4)))
      CALL CLOSEM(FITRA1)
      CALL CLOSEM(FITRA2)
      CALL CLOSEM(FITRA3)
      END
      SUBROUTINE ERROR
      COMMON FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35),IERR,IFILE
      GO TO (100,200,300,400) IFILE
  100 IERR = IFETCH(FITRA1,3LIRS)
      CALL STOREF(FITRA1,3LIRS,0)
      GO TO 500
  200 IERR = IFETCH(FITRA2,3LIRS)
      CALL STOREF(FITRA2,3LIRS,0)
      GO TO 500
  300 IERR = IFETCH(FITRA3,3LIRS)
      CALL STOREF(FITRA3,3LIRS,0)
      GO TO 500
  400 IERR = IFETCH(FITRA4,3LIRS)
      CALL STOREF(FITRA4,3LIRS,0)
  500 IF(IERR.EQ.0) RETURN
C     PRINT 601,IFILE,IERR
  601 FORMAT(* RA*,I1,* ERROR*,O10)
      RETURN
      END
```

D.3 Program RETD for performing a basic analysis of the data

```
      PROGRAM  RETD(INPUT,OUTPUT)                                       RETD
C     MAIN PROGRAM                                                      RETD
      COMMON XDATA(100),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        REDUCE
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RETD
      COMMON /HITBLK/LHIT(100),MDATE(100),ISAV(16),MTVOL(100)           REDUCE
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   RETD
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           RETD
      COMMON/RG/ DATESC(3,5);IVV(4), SSMEAN(3), SSIGMA(3), NNN(3),SSE(3)RETD
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      RETD
     +                MFUNC,IFILE,IERR                                  RETL
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           RETD
C     START,LAUNCH,SPLASH DOWN                                          JAN25
      DATA DATESC/180.,208.,265.,114.,144.,172.,189.,209.,268.,         DEC10
     X 283.,320.,404.,  290.,342.,354./                                 DEC10
C     SL4 SPLASH DOWN IS 39  FEB 8 1974                                 DEC10
      IOPLOT = 0                                                        RETD
      KSKIP = 0                                                         RETD
C     IFFF IS LOOP CONTROL TO ALLOW OVERLAY                             JAN25
      IFFF = -1                                                         RETD
    1 CALL RET                                                          RETD
      CALL STAT                                                         RETD
      GO TO 1                                                           RETD
      END                                                               RETD
      SUBROUTINE LINE(X,Y,N,M,L,LL)                                     LINE
C     X IS THE DATE. (IMDEPENDENT VARIABLE)                             LINE
C     Y IS THE DATA. (DEPENDENT VARIABLE)                               LINE
C     IFLAG = 13   LAST POINT NOT VALID                                 LINE
C     JFLAG = 13   LAST POINT VALID                                     LINE
C     ISFLAG IS THE NUMBER OF POINTS PLOTED.                            LINE
      DIMENSION X(1), Y(1)                                              LINE
      DATA D/0.04/                                                      LINE
      IFLAG = 0                                                         LINE
      JFLAG = 0                                                         LINE
      ISFLAG = 0                                                        LINE
      IP = 3                                                            LINE
      IF(N - 1) 9,1,1                                                   LINE
    1 DO 6 I=1,N                                                        LINE
      II = I*M - M + 1                                                  LINE
      XP = (X(II) - X(N + M))/X(N + 2*M)                                LINE
      YP = (Y(II) - Y(N + M))/Y(N + 2*M)                                LINE
C     CHECK TO SEE IF POINT VALUE IS VALID.                             LINE
      IF(Y(II)) 3,13,23                                                 LINE
    3 IY = -Y(II) + 0.5                                                 LINE
      IF(IY - 2) 13,14,13                                               LINE
C     THIS IS ZERO ON THE GRAPH.                                        LINE
   14 YP = -Y(N+1)/Y(N+2*M)                                             LINE
      GO TO 23                                                          LINE
C     INVALID POINT.                                                    LINE
   13 IFLAG = 13                                                        LINE
      GO TO 6                                                           LINE
C     VALID POINT.  CHECK FOR CONTINUOUS DATE.                          LINE
   23 JFLAG = 13                                                        LINE
      IF(ISFLAG) 25,25,24                                               LINE
   24 IF(X(II) - X(II-M) - 1.5) 25,35,35                                LINE
   25 IF(IFLAG) 35,26,35                                                LINE
C     PLOT THIS PEN DOWN.                                               LINE
   26 CALL PLOT(XP,YP,IP)                                               LINE
      ISFLAG = ISFLAG + 1                                               LINE
      IP = 2                                                            LINE
      GO TO 6                                                           LINE
```

```
C     DISCONTINUOUS GRAPH, PLOT AN X ON EACH END OF LINE.                LINE
   35 CALL WHERE(U,V,F)                                                  LINE
      IFLAG = 0                                                          LI
      KFLAG = JFLAG*ISFLAG                                               LI
      IF(KFLAG) 16,17,16                                                 LINE
   16  CALL SYMBOL(U,V,D,LL,0.0,-1)                                      LINE
      ISFLAG = ISFLAG + 1                                                LINE
   17 CALL SYMBOL(XP,YP,D,LL,0.0,-1)                                     LINE
      IP = 2                                                             LINE
      ISFLAG = ISFLAG + 1                                                LINE
    6 CONTINUE                                                           LINE
      KFLAG = IFLAG*JFLAG                                                LINE
      IF(KFLAG) 9,9,29                                                   LINE
   29 CALL WHERE(U,V,F)                                                  LINE
      CALL SYMBOL(U,V,D,LL,0.0,-1)                                       LINE
      ISFLAG = ISFLAG + 1                                                LINE
    9 RETURN                                                             LINE
      END                                                                LINE
      SUBROUTINE AXIS (X,Y,BCD,NC,SIZE,THETA,YMIN,DY,NDEC,NLAB,NTIC)     AXIS
      DIMENSION G(2), H(11)                                              AXIS
      DATA G/.8,.56/                                                     AXIS
      DATA H/.56,.4,.28,.2,.14,.1,.07,.05,.035,.025,.0175/               AXIS
      AC = NC                                                            AXIS
      SIG=SIGN(1.0,AC)                                                   AXIS
    2 NAC=IABS(NC)                                                       AXIS
      TH=THETA*0.017453294                                               AXIS
      IF(NLAB.LE.0) NLAB = 1                                             AXIS
      IF(NTIC.LE.0) NTIC = 1                                             AXIS
      FNLAB = NLAB                                                       AX
      N = SIZE*FNLAB + 0.1                                               AX
C     N = SIZE + 0.50                                                    AXIS
      CTH = COS  (TH)                                                    AXIS
      STH = SIN  (TH)                                                    AXIS
      CTN = CTH/FNLAB                                                    AXIS
      STN = STH/FNLAB                                                    AXIS
      TN = N                                                             AXIS
      N1 = N + 1                                                         AXIS
      N2 = N1/2                                                          AXIS
      ADY=ABS(DY/FNLAB)                                                  AXIS
C     ADY=ABS(DY)                                                        AXIS
      STAT=YMIN                                                          AXIS
      EXP = 0.0                                                          AXIS
      IF ( ADY ) 9,18,9                                                  AXIS
    9 IF ( ADY -100.0 ) 10,12,12                                         AXIS
   12 ADY = ADY / 10.0                                                   AXIS
      STAT=STAT/10.0                                                     AXIS
      EXP = EXP + 1.0                                                    AXIS
      GO TO 9                                                            AXIS
   14 ADY = ADY * 10.0                                                   AXIS
      STAT=STAT*10.0                                                     AXIS
      EXP = EXP - 1.0                                                    AXIS
   10 IF ( ADY - 1.00 ) 14,18,18                                         AXIS
C  10 IF ( ADY - 0.01 ) 14,18,18                                         AXIS
C  18 XA = X  - (.20 * SIG  - .05) *STH - .0857 * CTH                    AXIS
   18 XA = X  - (H(NLAB+1)  * SIG  - H(NLAB+5)) *STH - .0857 * CTH       AX
C     YA = Y  + (.20 * SIG  - .05) * CTH - .0857 * STH                   AX
      YA = Y  + (H(NLAB+1) * SIG  - H(NLAB+5)) * CTH - .0857 * STH       AXIS
      I = 0                                                              AXIS
   25 I = I + 1                                                          AXIS
C     CALL NUMBER (XA,YA,0.1,STAT,THETA,2)                               AXIS
```

```
      CALL NUMBER (XA,YA,H(NLAB+3),STAT,THETA,NDEC)                     AXIS
      STAT=STAT+SIGN(ADY,DY)                                            AXIS
C     XA = XA + CTH                                                     AXIS
      XA = XA + CTN                                                     AXIS
C     YA = YA + STH                                                     AXIS
      YA = YA + STN                                                     AXIS
      IF(I - N2) 25,31,26                                               AXIS
   26 IF(I - N1) 25,60,60                                               AXIS
   31 TNC = NAC + 7                                                     AXIS
C     XC = X + (SIZE / 2.0 -.06 * TNC)*CTH - (-.07 + SIG *.36)* STH     AXIS
      XC = X + (SIZE / 2.0 -H(NLAB+4) * TNC)*CTH                        AXIS
     1- (-H(NLAB+4) + SIG *(H(NLAB) + H(NLAB+3)))* STH                  AXIS
C     YC = Y + (SIZE / 2.0 -.06 * TNC)*STH + (-.07 + SIG *.36)* CTH     AXIS
      YC = Y + (SIZE / 2.0 -H(NLAB+4) * TNC)*STH                        AXIS
     1+ (-H(NLAB+4) + SIG *(H(NLAB) + H(NLAB+3)))* CTH                  AXIS
C     CALL SYMBOL (XC,YC,0.14,BCD,THETA,NAC)                            AXIS
      CALL SYMBOL (XC,YC,H(NLAB+2),BCD,THETA,NAC)                       AXIS
      XC = XC +((TNC -6.0) * 0.12)* CTH                                 AXIS
      YC = YC +((TNC -6.0) * 0.12)* STH                                 AXIS
      IF (EXP) 35,50,35                                                 AXIS
C  35 CALL SYMBOL (XC,YC,0.14,@(X10  )@ ,THETA,7)                       AXIS
C  35 CALL SYMBOL (XC,YC,H(NLAB+2),@(X10  )@ ,THETA,7)                  AXIS
   35 CALL SYMBOL (XC,YC,H(NLAB+2),7H(X10  ),THETA,7)                   AXIS
C     XC = XC + .48 * CTH  -.07 * STH                                   AXIS
      XC=XC+.38*CTH-H(NLAB+4)*STH                                       DEC10
C     YC = YC + .48 * STH  +.07 * CTH                                   AXIS
      YC=YC+.38*STH+H(NLAB+4)*CTH                                       DEC10
C  40 CALL NUMBER (XC,YC,0.10,EXP,THETA,-1)                             AXIS
   40 CALL NUMBER (XC,YC,H(NLAB+3),EXP,THETA,-1)                        AXIS
   50 GO TO 25                                                          AXIS
   60 FNTIC = NTIC                                                      AXIS
      NT = N*NTIC                                                       AXIS
      TN = NT                                                           AXIS
      CTH = CTN/FNTIC                                                   AXIS
      STH = STN/FNTIC                                                   AXIS
      XB = X + TN*CTH                                                   AXIS
      YB = Y + TN*STH                                                   AXIS
      XDELT = - H(6 - NTIC) * SIG  * STH                                AXIS
      YDELT = H(6 - NTIC) * SIG  * CTH                                  AXIS
      XA = XB + XDELT + XDELT                                           AXIS
C     XA = XB- 0.1 * SIG  * STH                                         AXIS
      YA = YB + YDELT + YDELT                                           AXIS
C     YA = YB+ 0.1 * SIG  * CTH                                         AXIS
      CALL PLOT (XA,YA,3)                                               AXIS
      XA = XA - XDELT                                                   AXIS
      YA = YA - YDELT                                                   AXIS
C     DO 20  I =1,N                                                     AXIS
      DO 20  I =1,N                                                     AXIS
      DO 20 II =1,NTIC                                                  AXIS
      IF(II.LT.NTIC) GO TO 45                                           AXIS
      XX = XDELT                                                        AXIS
      YY = YDELT                                                        AXIS
      GO TO 46                                                          AXIS
   45 XX = 0.                                                           AXIS
      YY = 0.                                                           AXIS
   46 CONTINUE                                                          AXIS
      CALL PLOT (XB,YB,2)                                               AXIS
      XC = XB - CTH                                                     AXIS
      YC = YB - STH                                                     AXIS
      CALL PLOT (XC,YC,2)                                               AXIS
```

```
C     XA = XA - CTH                                                     AXIS
      XA = XA - CTH + XX                                                AXIS
C     YA = YA - STH                                                     AXIS
      YA = YA - STH + YY                                                AXIS
      CALL PLOT (XA,YA,2)                                               AXIS
      XA = XA - XX                                                      AXIS
      YA = YA - YY                                                      AXIS
      XB = XC                                                           AXIS
   20 YB = YC                                                           AXIS
      RETURN                                                            AXIS
      END                                                               AXIS
      SUBROUTINE SCALE (X,S,N,K)                                        SCALE
C                                                                       SCALE
C  WHERE-  X  IS THE NAME OF THE ARRAY OF DATA TO BE SCANNED FOR MAXIMUMSCALE
C             AND MINIMUM VALUES. AN ADJUSTED MINIMUM VALUE WILL BE     SCALE
C             STORED IN X(N*K+1). AN ADJUSTED DX(MAX.-MIN.) WILL BE     SCALE
C             STORED IN X(N*K+K+1).                                     SCALE
C          S  IS THE LENGTH OVER WHICH THIS DATA IS TO BE PLOTTED.      SCALE
C          N  IS THE NUMBER OF DATA POINTS IN THE ARRAY X.              SCALE
C          K  IS THE REPEAT CYCLE OF A MIXED ARRAY.(NORMALLY 1)         SCALE
C                                                                       SCALE
      DIMENSION X(2)                                                    SCALE
      IT = 13                                                           SCALE
      NP = N * K                                                        SCALE
      L = NP + 1                                                        SCALE
      J = NP +K + 1                                                     SCALE
C     XMAX = X(1)                                                       SCALE
C     X(L) = X(1)                                                       SCALE
      DO 2 I=1,NP,K                                                     SCALE
      IF(X(I)) 2,2,3                                                    SCALE
    2 CONTINUE                                                          SCALE
    3 XMAX = X(I)                                                       SCALE
C     X(L)= X(I)                                                        SCALE
      X(L)= 0.0                                                         SCALE
      DO 10 I = 1,NP,K                                                  SCALE
      IF(X(I)) 22,10,23                                                 SCALE
   22 ITEST = 2.5 - X(I)                                                SCALE
      IF(ITEST) 10,24,10                                                SCALE
   24 X(L) = 0.0                                                        SCALE
      IT = 0                                                            SCALE
      GO TO 10                                                          SCALE
   23 IF (XMAX-X(I)) 5,6,6                                              SCALE
    5 XMAX = X(I)                                                       SCALE
    6 IF (X(L)-X(I))10,10,7                                             SCALE
    7 X(L) = X(I)                                                       SCALE
   10 CONTINUE                                                          SCALE
      DX = (XMAX - X(L)) /S                                             SCALE
      IF (DX) 31,31,30                                                  SCALE
   31 X(J) = 1.0                                                        SCALE
      X(L) = X(L) - 0.5                                                 SCALE
      RETURN                                                            SCALE
   30 IDX = ALOG10 (DX)                                                 SCALE
      IXMN = X(L) * 10.0 ** (-IDX)                                      SCALE
      IF (X(L))32,33,34                                                 SCALE
   32 IXMN = X(L) * 10.0 ** (-IDX) - 0.99                               SCALE
   34 X(L) = IXMN                                                       SCALE
      X(L) = X(L) * 10.0 ** IDX                                         SCALE
   33 DX = ALOG10 ((XMAX-X(L))/S)                                       SCALE
      IDX = DX                                                          SCALE
      XMAX = IDX                                                        SCALE
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      DX=10.0**(DX-XMAX)                                                  SCALE
      XMAX = 1.0                                                          SCALE
   41 IF (DX-1.0) 40,20,11                                                SCALE
   40 DX = DX * 10.0                                                      SCALE
      IDX = IDX - 1                                                       SCALE
      GO TO 41                                                            SCALE
   11 XMAX=2.0                                                            SCALE
      IF(DX-2.0) 20,20,12                                                 SCALE
   12 XMAX = 4.0                                                          SCALE
      IF (DX-4.0) 20,20,13                                                SCALE
   13 XMAX=5.0                                                            SCALE
      IF(DX-5.0) 20,20,14                                                 SCALE
   14 XMAX=8.0                                                            SCALE
      IF (DX-8.0) 20,20,15                                                SCALE
   15 XMAX=10.0                                                           SCALE
   20 X(J) = XMAX * 10.0 ** IDX                                           SCALE
      IF(IT) 49,49,39                                                     SCALE
   39 CONTINUE                                                            SCALE
      IMAX = XMAX + 0.00001                                               SCALE
      IXMN = X(L) * 10.0 ** (-IDX)                                        SCALE
      IMOD = IXMN/IMAX*IMAX                                               SCALE
      X(L) = IMOD                                                         SCALE
      X(L) = X(L) * 10.0 ** IDX                                           SCALE
      GO TO 59                                                            SCALE
   49 CONTINUE                                                            SCALE
      X(L) = 0.0                                                          SCALE
   59 CONTINUE                                                            SCALE
      RETURN                                                              SCALE
      END                                                                 SCALE
      SUBROUTINE RET                                                      RET
C                                                                         RET
C MSC ENDOCRINE DATA RETREIVAL PROGRAM                                    RET
C     FIRST LOOK STATISTICS PROGRAM.                                      RET
C                                                                         RET
      COMMON XDATA(100),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP          REDUCE
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)            RET
      COMMON /HITBLK/LHIT(100),MDATE(100),ISAV(16),MTVOL(100)             REDUCE
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),     RET
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA             RET
C     COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,        RET
      COMMON /SISBUF/ JBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,        RET
     +               MFUNC,IFILE,IERR                                     RET
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)             RET
      DIMENSION IBUF(14)                                                  RET
      EQUIVALENCE(IBUF,T)                                                 RET
      EXTERNAL ERROR                                                      RET
C                                                                         RET
C RA1=SAMPLE DIRECTORY  ***  RA2=URINE FILE  ***  RA3=BLOOD FILE          RET
C                       ***  RA4=DAILY FILE  ***                          RET
C                                                                         RET
C                                                                         RET
C PLACE KEYED FILES IN UPDATE MODE EXCLUDING @RA1@ WHICH IS               RET
C           TO BE USED AS A SEQUENTIAL SEARCH FILE                        RET
C           ASSIGNED TO FORTRAN UNIT NO. 1                                RET
C                                                                         RET
      IF(IFFF) 31,201,140                                                 RET
C  31 CALL RANDOM(4,@RA2@,125,5,7,100 ,100 ,ICODE,LOC)                    RET
   31 CONTINUE                                                            RET
      CALL FILEIS(FITRA1,3LLFN,3LRA1,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5     RET
     +           ,3LMRL, 350,3LMNR, 350,3LWSA, T)                         RET
```

```
      CALL STOREF(FITRA1,3LERL,20)                                      RET
      CALL STOREF(FITRA1,2LEX,  ERROR)                                  RET
      CALL OPENM(FITRA1,3LI-O)                                          RET
      CALL REWND(FITRA1)                                                RET
      CALL FILEIS(FITRA2,3LLFN,3LRA2,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +           ,3LMRL,1250,3LMNR,1250,3LWSA, T)                       RET
      CALL STOREF(FITRA2,3LERL,0)                                       RET
      CALL STOREF(FITRA2,2LEX,  ERROR)                                  RET
      CALL OPENM(FITRA2,5LINPUT)                                        RET
      CALL REWND(FITRA2)                                                RET
      CALL FILEIS(FITRA3,3LLFN,3LRA3,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +           ,3LMRL, 350,3LMNR, 350,3LWSA, T)                       RET
      CALL STOREF(FITRA3,3LERL,0)                                       RET
      CALL STOREF(FITRA3,2LEX,  ERROR)                                  RET
      CALL OPENM(FITRA3,5LINPUT)                                        RET
      CALL REWND(FITRA3)                                                RET
      CALL FILEIS(FITRA4,3LLFN,3LRA4,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +           ,3LMRL, 300,3LMNR, 300,3LWSA,T)                        RET
      CALL STOREF(FITRA4,3LERL,0)                                       RET
      CALL STOREF(FITRA4,2LEX,  ERROR)                                  RET
      CALL OPENM(FITRA4,5LINPUT)                                        RET
      CALL REWND(FITRA4)                                                RET
      IFFF = 0                                                          RET
C                                                                       RET
C INITIALIZE COUNTER FLAGS FOR THE FIRST PASS OF                        RET
C    ANY GIVEN RETREIVAL                                                RET
C                                                                       RET
  201 ISFLG = 1                                                         RET
      IDFLG = 1                                                         RET
      IMFLG = 1                                                         RET
      ITPFLG = 1                                                        RET
      ITTFLG = 1                                                        RET
      IFFF = 1                                                          RET
C                                                                       RET
C READ ONE DATA CARD                                                    RET
C                                                                       RET
    1 READ 200,(ISAV(I),I=1,16)                                         RET
  200 FORMAT(A4,1X,A4,1X,14I5)                                          RET
C                                                                       RET
C DETERMINE CARD TYPE AND COUNTER SEQUENCE                              RET
C                                                                       RET
      IF(ISAV(1).EQ.4HJOB ) GO TO 19                                    RET
      IF(ISAV(1).EQ.4HSTUD.AND.ISFLG.EQ.1) GO TO  5                     RET
      IF(ISAV(1).EQ.4HSTUD.AND.ISFLG.EQ.0) GO TO 45                     RET
      IF(ISAV(1).EQ.4HDATE.AND.IDFLG.EQ.1) GO TO 6                      RET
      IF(ISAV(1).EQ.4HDATE.AND.IDFLG.EQ.0) GO TO 46                     RET
      IF(ISAV(1).EQ.4HMAN .AND.IMFLG.EQ.1) GO TO  7                     RET
      IF(ISAV(1).EQ.4HMAN .AND.IMFLG.EQ.0) GO TO 47                     RET
      IF(ISAV(1).EQ.4HTYPE.AND.ITPFLG.EQ.1) GO TO  8                    RET
      IF(ISAV(1).EQ.4HTYPE.AND.ITPFLG.EQ.0) GO TO 48                    RET
      IF(ISAV(1).EQ.4HTEST.AND.ITTFLG.EQ.1) GO TO  9                    RET
      IF(ISAV(1).EQ.4HTEST.AND.ITTFLG.EQ.0) GO TO 49                    RET
      IF(ISAV(1).EQ.4HEND ) GO TO 40                                    RET
      IF(ISAV(1).EQ.4HEOF ) GO TO 99                                    RET
C                                                                       RET
C BUILD RETREIVAL CRITERIA ARRAYS                                       RET
C                                                                       RET
    5 JSTALL=0                                                          RET
      IS = 0                                                            RET
      ISFLG = 0                                                         RET
```

```
   45 CALL SETCRI(LSTUDY,IS,JSTALL)                                     RET
C     OUTPUT,(LSTUDY(I),I=1,5),IS,JSTALL                                RET
      GO TO 1                                                           RET
    6 JDTALL=0                                                          RET
      ID = 0                                                            RET
      IDFLG = 0                                                         RET
   46 CALL SETCRI(LDATE,ID,JDTALL)                                      RET
C     OUTPUT,(LDATE(I),I=1,10),ID,JDTALL                                RET
      GO TO 1                                                           RET
    7 MANALL=0                                                          RET
      IM = 0                                                            RET
      IMFLG = 0                                                         RET
   47 CALL SETCRI(LMAN,IM,MANALL)                                       RET
C     OUTPUT,(LMAN(I),I=1,9),IM,MANALL                                  RET
      GO TO 1                                                           RET
    8 JTPALL=0                                                          RET
      ITP = 0                                                           RET
      ITPFLG = 0                                                        RET
   48 CALL SETCRI(LTYPE,ITP,JTPALL)                                     RET
C     OUTPUT,(LTYPE(I),I=1,10),ITP,JTPALL                               RET
      GO TO 1                                                           RET
    9 JTTALL=0                                                          RET
      ITT = 0                                                           RET
      ITTFLG = 0                                                        RET
   49 CALL SETCRI(LTEST,ITT,JTTALL)                                     RET
      ITT=1                                                             RET
C     IF(JTTALL.EQ.1) ITT = 124                                         RET
      LSTART = ISAV(3)                                                  RET
      LSTOP  = ISAV(4)                                                  RET
      IF(LSTOP.EQ.0) LSTOP=LSTART                                       DEC10
      GO TO 1                                                           RET
   19 DO 119 I=1,16                                                     RET
  119 JOB(I)=ISAV(I)                                                    RET
      IF(IOPLOT.EQ.0.AND.JOB(3).GE.1000) CALL PLOTS(14HNASA ENDOCRINE,  RET
     1  14)                                                             RET
      IF(JOB(3).GE.1000) IOPLOT = 999                                   RET
      IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH.OR.JOB(2).EQ.4HVOLU)GOTO1 DEC10
      JOB(2)=4HDATE                                                     DEC10
      PRINT 601                                                         DEC10
  601 FORMAT(* UNKNOWN JOB PARAMETER DATE ASSUMED*)                     DEC10
      GO TO 1                                                           RET
C                                                                       RET
C BUILD HIT ARRAY OF SAMPLE NUMBERS                                     RET
C                                                                       RET
   40 CONTINUE                                                          RET
      LT = LSTART - 1                                                   RET
C                                                                       RET
C     DO 4321 LT=LSTART,LSTOP                                           RET
  140 IF(IFFF - 2) 145,240,145                                          RET
  145 LT = LT + 1                                                       RET
C                                                                       RET
      IF(LT - LSTOP) 150,150,4321                                       RET
  150 LM = 0                                                            RET
      IFFF = 2                                                          RET
C     IF(KOT.EQ.0) CALL SSWTCH(1,KKT)                                   RET
C     IF(KKT.EQ.1) GO TO 999                                            RET
      LTEST(1) = LT                                                     RET
C     DO 4321 LM=1,3                                                    RET
  240 LM = LM + 1                                                       RET
      IF(LM - 3) 250,250,245                                            RET
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  245 IFFF = 1                                                          RET
      GO TO 140                                                         RET
  250 LMAN(1) = LM                                                      R
      IH = 1                                                            R
C     REWIND 1                                                          RET
      CALL REWND(FITRA1)                                                RET
C                                                                       RET
C                                                                       RET
C THE KEYED (RA1) SAMPLE DIRECTORY FILE IS TREATED AS A SEQUENTIAL      RET
C     FILE DURING THE SEARCH FOR SAMPLES WHICH SATISFY                  RET
C                 THE INPUT CRITERIA                                    RET
C                                                                       RET
C  10 BUFFER IN(1,1)(IBUF(1),IBUF(14))                                  RET
   10 CALL GETN(FITRA1)                                                 RET
      IF(IFETCH(FITRA1,2LFP).EQ.100B) GO TO 23                          RET
    2 IF(JSTALL.EQ.1) GO TO 12                                          RET
      DO 11 I=1,IS                                                      RET
      IF(IBUF(2).EQ.LSTUDY(I)) GO TO 12                                 RET
   11 CONTINUE                                                          RET
      GO TO 10                                                          RET
   12 IF(JDTALL.EQ.1.AND.JOB(2).EQ.4HVOLU) GO TO 44                     RET
C                                                                       RET
C CHECK FOR SIMULTANEOUS @ALL@ AND DATE @SAVE@ OPTION                   RET
C                                                                       RET
      IF(JDTALL.EQ.1.AND.(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH))GO TO 41RET
      DO 13 I=1,ID                                                      RET
      IF(IBUF(3).EQ.LDATE(I)) GO TO 14                                  RET
   13 CONTINUE                                                          RET
      GO TO 10                                                          RE
   41 MDSAV = IBUF(3)                                                   R
      GO TO 44                                                          RET
C                                                                       RET
C CHECK FOR DATE SAVE OPTION                                            RET
C                                                                       RET
   14 IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH) MDSAV=LDATE(I)           RET
   44  IF(MANALL.EQ.1) GO TO 16                                         RET
      DO 15 I=1,IM                                                      RET
      IF(IBUF(4).EQ.LMAN(I)) GO TO 16                                   RET
   15 CONTINUE                                                          RET
      GO TO 10                                                          RET
   16 IF(JTPALL.EQ.1) GO TO 18                                          RET
      DO 17 I=1,ITP                                                     RET
      IF(IBUF(5).EQ.LTYPE(I)) GO TO 18                                  RET
   17 CONTINUE                                                          RET
      GO TO 10                                                          RET
C                                                                       RET
C CHECK FOR MASTER SAMPLE NUMBER                                        RET
C                                                                       RET
   18 IF(IBUF(14).EQ.0) GO TO 21                                        RET
      MIH = IH-1                                                        RET
      DO 20 I=1,MIH                                                     RET
      IF(LHIT(I).EQ.IBUF(14)) GO TO 10                                  RET
   20 CONTINUE                                                          RET
      LHIT(IH)=IBUF(14)                                                 RET
C     PRINT 220,(LHIT(I),I=1,10)                                        RE
C 220 FORMAT(5X,5HLHIT2,5X,10I10)                                       R
      GO TO 22                                                          RET
   21 LHIT(IH)=IBUF(1)                                                  RET
C     PRINT 221,(LHIT(I),I=1,10)                                        RET
C 221 FORMAT(5X,5HLHIT1,5X,10I10)                                       RET
```

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C                                                                       RET
C IF DATE SAVE OPTION WAS SPECIFIED FILL DATE ARRAY CORRESPONDING       RET
C    TO SAMPLE NUMBER HIT ARRAY                                         RET
C                                                                       RET
   22 IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH) MDATE(IH)=MDSAV          RET
C                                                                       RET
C IF TOTAL VOLUME SAVE OPTION WAS SPECIFIED FILL VOLUME ARRAY           RET
C         CORRESPONDING TO SAMPLE NUMBER HIT ARRAY                      RET
C                                                                       RET
      IF(JOB(2).EQ.4HVOLU.OR.JOB(2).EQ.4HBOTH)MTVOL(IH)=IBUF(10)        RET
       IH=IH+1                                                          RET
      IF(IH.LE.101) GO TO 10                                            REDUCE
   23 NSMP = IH - 1                                                     RET
      IF(NSMP.LE.100) GO TO 35                                          REDUCE
      PRINT 30                                                          RET
   30 FORMAT(1H1,17HHIT FILE OVERFLOW    )                              RET
      STOP 30                                                           RET
C                                                                       RET
   35 CALL RETRVE                                                       RET
      PRINT 300, LSTUDY,LMAN,JOB,LTYPE,NSMP,NDATA                       RET
  300 FORMAT(1H0,6HLSTUDY,10I10,//,2X,4HLMAN,9I10,//,                   DEC10
     .   1X, 4HJOB ,A4,5X,A4,5X,14I6,//,6H LTYPE,20I5,//,               RET
     .   1X, 7HNSMP = ,I5,10X,8HNDATA = ,I5)                            DEC10
      PRINT 301,(LDATE(I),I=1,ID)                                       RET
  301 FORMAT(6H LDATE /,(10I10))                                        RET
      PRINT 302,(LTEST(I),I=1,ITT)                                      RET
  302 FORMAT(6H LTEST  ,(10I10))                                        RET
      PRINT 306,(MTVOL(I),I=1,NSMP)                                     RET
  306 FORMAT(1H0,5HMTVOL,/,(10I10))                                     DEC10
      PRINT 303,(MDATE(I),I=1,NSMP)                                     RET
  303 FORMAT(1H0,5HMDATE,/,(10I10))                                     DEC10
      PRINT 304,(LHIT(I),I=1,NSMP)                                      RET
  304 FORMAT(/ ,6H LHIT ,/,(10I10))                                     DEC10
      PRINT 305,(XDATA(I),I=1,NDATA)                                    RET
  305 FORMAT(1H0,5HXDATA,/,(8F15.6))                                    DEC10
C     PRINT 300, LSTUDY,LMAN,JOB,LTYPE,NSMP,NDATA                       RET
C 300 FORMAT(1H1,6HLSTUDY,10I10,//,2X,4HLMAN,9I10,//,                   RET
C    .         4HJOB ,A4,5X,A4,5X,14I6,//,5HLTYPE,20I5,//,              RET
C    .         7HNSMP = ,I5,10X,8HNDATA = ,I5,// )                      RET
C     PRINT 301,(LDATE(I),I=1,ID)                                       RET
C 301 FORMAT(5HLDATE /,(10I10))                                         RET
C     PRINT 302,(LTEST(I),I=1,ITT)                                      RET
C 302 FORMAT(5HLTEST  ,(10I10))                                         RET
C     PRINT 306,(MTVOL(I),I=1,NSMP)                                     RET
C 306 FORMAT(1H1,5HMTVOL,/,(10I10))                                     RET
C     PRINT 303,(MDATE(I),I=1,NSMP)                                     RET
C 303 FORMAT(1H1,5HMDATE,/,(10I10))                                     RET
C     PRINT 304,(LHIT(I),I=1,NSMP)                                      RET
C 304 FORMAT(//,5HLHIT ,/,(10I10))                                      RET
C     PRINT 305,(XDATA(I),I=1,NDATA)                                    RET
C 305 FORMAT(1H1,5HXDATA,/,(8F15.6))                                    RET
C                                                                       RET
C                                                                       RET
C     -----------------------------------------------------------------RET
      RETURN                                                            RET
C     CALL STAT                                                         RET
 4321 CONTINUE                                                          RET
      IFFF = 0                                                          RET
C                                                                       RET
C     -----------------------------------------------------------------RET
```

```
C                                                                       RET
C     REWIND 1                                                          RET
      CALL REWND(FITRA1)                                                RET
      GO TO 201                                                         RET
C                                                                       RET
  888 PRINT 8800                                                        RET
 8800 FORMAT(15H FILE 1 REWOUND)                                        RET
      RETURN                                                            RET
   99 CONTINUE                                                          RET
      CALL CLOSEM(FITRA1)                                               RET
      CALL CLOSEM(FITRA2)                                               RET
      CALL CLOSEM(FITRA3)                                               RET
      CALL CLOSEM(FITRA4)                                               RET
      IF(IOPLOT) 199,199,999                                            RET
  999 CALL STOPPLT                                                      RET
      PRINT 900                                                         RET
  900 FORMAT(19H0NORMAL END OF JOB.)                                    RET
      STOP 2000                                                         RET
  199 STOP 1                                                            RET
      END                                                               RET
      SUBROUTINE SETCRI(LBUF,JNDX,LALL)                                 SETCRI
C  THIS SUBROUTINE STORES INFORMATION FROM ONE DATA CARD INTO THE       SETCRI
C                          CORRESPONDING CRITERIA ARRAY                 SETCRI
C                                                                       SETCRI
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          SETCRI
      COMMON /HITBLK/LHIT(100),MDATE(100),ISAV(16),MTVOL(100)           REDUCE
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   SETCRI
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           SETCRI
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      SETCRI
     +                MFUNC,IFILE,IERR                                  SETCRI
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           SETCRI
      DIMENSION LBUF(1)                                                 SETCRI
      IF(ISAV(2).EQ.4HALL .OR.ISAV(2).EQ.4H    ) GO TO 1                SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=ISAV(3)                                                SETCRI
      IF(ISAV(2).EQ.4HEACH) GO TO 3                                     SETCRI
      INXT=ISAV(3)+1                                                    SETCRI
    2 IF(INXT.GT.ISAV(4)) RETURN                                        SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=INXT                                                   SETCRI
      INXT=INXT+1                                                       SETCRI
      GO TO 2                                                           SETCRI
    3 DO 5 I=4,16                                                       SETCRI
      IF(ISAV(I).EQ.0) RETURN                                           SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=ISAV(I)                                                SETCRI
    5 CONTINUE                                                          SETCRI
      RETURN                                                            SETCRI
    1 LALL=1                                                            SETCRI
      RETURN                                                            SETCRI
      END                                                               SETCRI
      SUBROUTINE RETRVE                                                 RETRVE
C                                                                       RETRVE
C THIS SUBROUTINE RETREVES THOSE DATA VALUES FROM THE BLOOD OR          RETRVE
C       URINE FILES WHICH SATISFY THE INPUT CRITERIA                    RETRVE
C       THE DATA VALUES ARE STORED IN ARRAY XDATA                       RETRVE
C                                                                       RETRVE
      COMMON XDATA(100),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        REDUCE
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RETRVE
      COMMON/INDEX/INDX(136),INDX3(136)                                 DEC10
      COMMON /HITBLK/LHIT(100),MDATE(100),ISAV(16),MTVOL(100)           REDUCE
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   RETRVE
     .               LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA            RETRVE
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEE,KYE,      RETRVE
     +               MFUNC,IFILE,IERR                                   RETRVE
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           RETRVE
      DIMENSION XTEMP(125)                                              RETRVE
      INTEGER KEY(2)                                                    RETRVE
      EQUIVALENCE(T,XTEMP)                                              RETRVE
      EQUIVALENCE (KEE,KEY(2))                                          RETRVE
      DATA(INDX(I),I=1,136)/400,401,402,403,404,405,503,406,407,408,409,DEC10
     .  410,                                                            DEC10
     1  411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,DEC10
     2  427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,DEC10
     3  443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,DEC10
     4  459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,DEC10
     5  475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,DEC10
     6  491,492,493,494,495,496,497,498,499,500,501,502,300,301,302,303,DEC10
     7  304,305,306,307,321,308,309,310,311,312,313,314,315,316,317,318,DEC10
     .  319,                                                            DEC10
     8  320,514,515,516,517,518,519,520,521,522,523/                    DEC10
      DATA (INDX3(I),I=1,136)/2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,  DEC10
     1  18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,  DEC10
     2  39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,  DEC10
     3  60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,  DEC10
     4  81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,    DEC10
     5101,102,103,104,105,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,DEC10
     6  20,21,22,23,116,117,118,119,120,121,122,123,124,125/            DEC10
      DATA ICDT/445B/                                                   RETRVE
      M=1                                                               RETRVE
      KSAV=0                                                            RETRVE
      IERR=0                                                            RETRVE
      DO 27 K=1,NSMP                                                    RETRVE
      DO 27 I=1,ITT                                                     RETRVE
C                                                                       RETRVE
C  IDENTIFY TEST NUMBER IN INDEX                                        RETRVE
C                                                                       RETRVE
      DO 24 J=1,136                                                     DEC10
      IF(LTEST(I).EQ.INDX(J)) GO TO 25                                  DEC10
   24 CONTINUE                                                          DEC10
      STOP @INVALID TEST NUMBER@                                        DEC10
   25 IJ=J                                                              DEC10
      LREC=INDX3(IJ)                                                    DEC10
      IF(LTEST(I) -400) 41,31,31                                        RETRVE
   31 INDX1 = 1RU                                                       RETRVE
      GO TO 50                                                          RETRVE
   41 INDX1 = 1RB                                                       RETRVE
C                                                                       RETRVE
C  PICK UP KEY FROM HIT ARRAY OF SAMPLE NUMBERS                         RETRVE
C                                                                       RETRVE
   50 KEY(2)=LHIT(K)                                                    RETRVE
C                                                                       RETRVE
C DETERMINE IF DATA NEEDED IS FROM CURRENT RECORD                       RETRVE
C                                                                       RETRVE
      IF(KEY(2).EQ.KSAV) GO TO 26                                       RETRVE
C                                                                       RETRVE
C  CHECK FOR URINE OR BLOOD FILE                                        RETRVE
C                                                                       RETRVE
C  29 IF(INDX1(IJ).EQ.1RU) GO TO 28                                     RETRVE
   29 IF(INDX1.EQ.1RU) GO TO 28                                         RETRVE
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C       CALL RANDOM(1,@RA3@,XTEMP,32,KEY,100 ,100 ,ICODE,LOC)              RETRVE
        CALL GET(FITRA3)                                                   RETRVE
        LOC = 3                                                            RETRVE
        IFILE = 3                                                          RETRVE
        IF(IERR.NE.0) GO TO 100                                            RETRVE
        GO TO 26                                                           RETRVE
C    28 CALL RANDOM(1,@RA2@,XTEMP,125,KEY,100 ,100 ,ICODE,LOC)             RETRVE
     28 CALL GET(FITRA2)                                                   RETRVE
        LOC = 2                                                            RETRVE
        IFILE = 2                                                          RETRVE
        IF(IERR.NE.0) GO TO 100                                            RETRVE
C                                                                          RETRVE
C                                                                          RETRVE
C FETCH WORD NUMBER OF DATA RECORD FROM INDEX, STORE DATA                  RETRVE
C    VALUE IN CURRENT XDATA LOCATION AND INCREMENT                         RETRVE
C             XDATA LOCATION COUNTER M                                     RETRVE
C                                                                          RETRVE
C                                                                          RETRVE
C    26 LREC=INDX3(IJ)                                                     RETRVE
     26 XDATA(M)=XTEMP(LREC)                                               RETRVE
     30 M=M+1                                                              RETRVE
        IF(M.GT.100) GO TO 110                                             REDUCE
        KSAV=KEY(2)                                                        RETRVE
     27 CONTINUE                                                           RETRVE
C                                                                          RETRVE
C                                                                          RETRVE
C NDATA = NUMBER OF DATA VALUES RETREIVED                                  RETRVE
C                                                                          RETRVE
C                                                                          RETRVE
        NDATA=M-1                                                          RETRVE
        RETURN                                                             RETRVE
    100 IF(IERR .EQ.ICDT) GO TO 105                                        RETRVE
        PRINT 101,IERR ,KEY(2)                                             RETRVE
    101 FORMAT(1H ,19HRANDOM ERROR-RETRVE,O8,5X,I4)                        RETRVE
        STOP 100                                                           RETRVE
    105 PRINT 104,KEY(2)                                                   RETRVE
    104 FORMAT(1H ,27HSAMPLE NO. NOT FOUND-RETRVE,5X,I4)                   RETRVE
        XDATA(M)=-1.                                                       RETRVE
        IERR=0                                                             RETRVE
        GO TO 30                                                           RETRVE
    110 PRINT 111                                                          RETRVE
    111 FORMAT(1H1,43HDATA BUFFER FULL BEFORE ALL DATA RETREIVED    )      RETRVE
        STOP 110                                                           RETRVE
        END                                                                RETRVE
        SUBROUTINE STAT                                                    STAT
        COMMON XDATA(100),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP         REDUCE
        COMMON /HITBLK/LHIT(100),MDATE(100),ISAV(16),MTVOL(100)            REDUCE
        COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),    STAT
     .                  LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA            STAT
        COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3),SSE(3)STAT
        REAL KSTUDY, KTYPE, KMAN, KTEST, NITS                              STAT
        DIMENSION ISIG(2)                                                  STAT
        DIMENSION X(1)                                                     STAT
        DIMENSION LTEXT(120), MTEXT(120), XOUT(120)                        STAT
        DIMENSION NDF(3), S(3), P(3), TM(3), WTV(3), XMS(3), IPP(3),IP2(3)STAT
        DIMENSION ID1(120), ID2(120), LK(3)                                STAT
        EQUIVALENCE(X,XDATA)                                               STAT
        DATA ID1/120*1/, LK/3*0/                                           STAT
        DATA IPP/4HPRE , 4HIN  , 4HPOST/                                   STAT
        DATA IP2/8HPRE-IN  , 8HIN-POST , 8HPRE-POST/                       STAT
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C                                                                       STAT
C     FILL OUTPUT ARRAY                                                 STAT
C                                                                       STAT
      DATA ISTAR/1H*/, IBLANK/1H /, ISAVE/4HSAVE/                       STAT
      DATA IPLUS/1H+/, IMINUS/1H-/, IPPL/2H++/, IMMI/2H--/              STAT
      DATA IDATE/4HDATE/, IVOLU/4HVOLU/, IBOTH/4HBOTH/                  STAT
      NOBS = NDATA                                                      STAT
    1 IF(NOBS - 1) 999,999,2                                            STAT
    2 LOOP = ITT                                                        STAT
      IDATEF = 0                                                        STAT
      IVOLUF = 0                                                        STAT
      IF(JOB(2).EQ.IDATE) IDATEF = 3                                    STAT
      IF(JOB(2).EQ.IVOLU) IVOLUF = 3                                    STAT
      IF(JOB(2).NE.IBOTH) GO TO 3                                       STAT
      IDATEF = 3                                                        STAT
      IVOLUF = 3                                                        STAT
    3 KKK = NOBS/LOOP                                                   STAT
      CALL TEXT(LSTUDY(1), LTYPE(1), LMAN(1), LTEST(1),                 STAT
     X KSTUDY, KTYPE, KMAN, KTEST, NITS)                                STAT
      CALL DATE(IWORD)                                                  STAT
      PRINT 1000, JOB(3)                                                STAT
 1000 FORMAT(1H1,20X,42HNASA MSC ENDOCRINE DATA RETREIVAL PROGRAM.,I7/) STAT
      PRINT 500, LSTUDY(1), KSTUDY,IWORD                                STAT
  500 FORMAT(7H0STUDY.,I2,2X, A8,20X,A10)                               STAT
      PRINT 600, LTEST(1), KTEST,LMAN(1), KMAN                          STAT
  600 FORMAT(6H0TEST.,I3,2X A8 ,20X,4HMAN.,I4,2X, A8)                   STAT
      PRINT 700,(LTYPE(I),I=1,ITP)                                      DEC10
  700 FORMAT(6H0TYPE.,20I3)                                             DEC10
      PRINT 800, NITS                                                   STAT
  800 FORMAT(15H0JULIAN DATE    , A3)                                   STAT
C     DO 150 L=1,LOOP                                                   STAT
      L = 1                                                             STAT
      LOOP = 1                                                          STAT
      DO 210 II=LOOP,NOBS,LOOP                                          STAT
      I = II + L - LOOP                                                 STAT
      IPLACE = II/LOOP                                                  STAT
  210 XOUT(IPLACE) = XDATA(I)                                           STAT
C                                                                       STAT
C     SORT BY DATE                                                      STAT
C                                                                       STAT
      NOSLTS = NOBS/LOOP                                                STAT
      NM1 = NOSLTS - 1                                                  STAT
      DO 230 I=1,NM1                                                    STAT
      IMAX = 9999                                                       STAT
      ISUB = I                                                          STAT
      DO 220 J=I,NOSLTS                                                 STAT
      IF(IMAX-MDATE(J)) 220,220,211                                     STAT
  211 IMAX = MDATE(J)                                                   STAT
      ISUB = J                                                          STAT
  220 CONTINUE                                                          STAT
      ITEMP = MDATE(ISUB)                                               STAT
      TEMP = XOUT(ISUB)                                                 STAT
      MDATE(ISUB) = MDATE(I)                                            STAT
      XOUT(ISUB) = XOUT(I)                                              STAT
      MDATE(I) = ITEMP                                                  STAT
      XOUT(I) = TEMP                                                    STAT
  230 CONTINUE                                                          STAT
      IG = LSTUDY(1)                                                    STAT
      IVV(1) = 0                                                        STAT
      IVV(4) = NOSLTS                                                   STAT
      DO 240 I=1,NOSLTS                                                 STAT
      IF(MDATE(I).LE.DATESC(2,IG)) IVV(2) = I                           STAT
      IF(MDATE(I).LE.DATESC(3,IG)) IVV(3) = I                           STAT
  240 XDATA(I) = XOUT(I)                                                STAT
      DO 133 I=1,3                                                      STAT
      NFIRST = IVV(I) + 1                                               STAT
      NLAST = IVV(I + 1)                                                STAT
      CALL MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                     STAT
      SSMEAN(I) = SMEAN                                                 STAT
      SSIGMA(I) = SIGMA                                                 STAT
      NNN(I) = NN                                                       STAT
  133 CONTINUE                                                          STAT
      NFIRST = 1                                                        STAT
      NLAST = NOSLTS                                                    STAT
      CALL MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                     STAT
C                                                                       STAT
C     IF THERE ARE 2 OR MORE PRE-FLIGHT OBSERVATIONS THE EXTREME VALUES STAT
C     ARE FLAGED ON THE BASIS OF PRE-FLIGHT MEAN AND STD. DEV.          STAT
C     OTHERWISE THE TOTAL MEAN AND STD. DEV. ARE USED.                  STAT
C                                                                       STAT
      IF(NNN(1) - 2) 134,136,136                                        STAT
  134 SSG = SIGMA                                                       STAT
      SSM = SMEAN                                                       STAT
      GO TO 137                                                         STAT
  136 SSG = SSIGMA(1)                                                   STAT
      SSM = SSMEAN(1)                                                   STAT
  137 T01 = 2.3263*SSG                                                  STAT
      T05 = 1.6449*SSG                                                  STAT
      DO 166 II=1,3                                                     STAT
      IFIRST = IVV(II)+ 1                                               STAT
      ILAST = IVV(II + 1)                                               STAT
      IF(IFIRST - ILAST) 162,166,166                                    STAT
  162 DO 165 I=IFIRST,ILAST                                             STAT
      MTEXT(I) = IBLANK                                                 STAT
      IF(X(I)) 164,165,153                                              STAT
  153 DELTA = X(I) - SSM                                                STAT
      IF(DELTA) 155,154,157                                             STAT
  154 IF(X(I).NE.2.0) GO TO 164                                         STAT
      DELTA = SSM                                                       STAT
      GO TO 156                                                         STAT
  155 DELTA = -DELTA                                                    STAT
  156 IF(DELTA.GE.T05) MTEXT(I) = IMINUS                                STAT
      IF(DELTA.GE.T01) MTEXT(I) = IMMI                                  STAT
      GO TO 164                                                         STAT
  157 IF(DELTA.GE.T05) MTEXT(I) = IPLUS                                 STAT
      IF(DELTA.GE.T01) MTEXT(I) = IPPL                                  STAT
  164 PRINT 400,MDATE(I), X(I), LTEXT(I), MTEXT(I)                      STAT
  165 CONTINUE                                                          STAT
      PRINT 900,SSMEAN(II), SSIGMA(II), NNN(II)                         STAT
  166 CONTINUE                                                          STAT
      IF(JOB(3) - 1000) 150,145,145                                     STAT
  145 IF(NN) 150,150,146                                                STAT
  146 CALL STPLOT(LOOP,NOBS,NSLOT,IWORD,KSTUDY,KTYPE,KMAN,KTEST,SMEAN,  STAT
     X SIGMA)                                                           STAT
  150 CONTINUE                                                          STAT
C                                                                       STAT
C      ICASE = 0    NO TESTS                                            STAT
C      ICASE = 1    PREFLIGHT ONLY                                      STAT
C      ICASE = 2    PRE AND INFLIGHT ONLY                               STAT
C      ICASE = 3    ALL                                                 STAT
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C       ICASE = 4    PRE AND POSTFLIGHT ONLY                                    STAT
C                                                                               STAT
        IF(NNN(1)-1) 170,170,171                                                DEC10
  170   NT = 0                                                                  STAT
        ICASE = 0                                                               STAT
        GO TO 999                                                               DEC10
  171   SSE(1) = SSIGMA(1)/SQRT(FLOAT(NNN(1)))                                  STAT
        PRINT 3000,NNN(1), SSMEAN(1), SSIGMA(1), SSE(1)                         STAT
 3000   FORMAT(20(4H----)/23H PARAMETRIC STATISTICS.//8H0SUMMARY/               STAT
      X39H0SAMPLE  N     MEAN          SD          SE/4H0PRE, I6, 3F11.3)       STAT
        IF(NNN(2)-1) 172,172,176                                                DEC10
  172   IF(NNN(3)-1) 173,173,174                                                DEC10
  173   NT = 1                                                                  STAT
        ICASE = 1                                                               STAT
        GO TO 999                                                               DEC10
  174   SSE(3) = SSIGMA(3)/SQRT(FLOAT(NNN(3)))                                  STAT
        PRINT3010,NNN(3), SSMEAN(3), SSIGMA(3), SSE(3)                          STAT
        NT = 2                                                                  STAT
        ICASE = 4                                                               STAT
C                                                                               STAT
C       FOR CASE 4 FIX NNN AND X FOR ACRDAN                                     DEC10
        IF(NNN(2).EQ.1) GO TO 175                                               DEC10
        NNN(2)=NNN(3)                                                           DEC10
        GO TO 180                                                               DEC10
C       NNN(2) IS 1 MOVE X                                                      DEC10
  175   CONTINUE                                                                DEC10
        NNN1=NNN(1)+1                                                           DEC10
        NSLTM1=NOSLTS-1                                                         DEC10
        DO 179 I=NNN1,NSLTM1                                                    DEC10
        X(I)=X(I+1)                                                             DEC10
  179   CONTINUE                                                                DEC10
        NNN(2)=NNN(3)                                                           DEC10
        GO TO 180                                                               DEC10
C       CHANGE THIS LATER                                                       STAT
C                                                                               STAT
  176   SSE(2) = SSIGMA(2)/SQRT(FLOAT(NNN(2)))                                  STAT
        PRINT3020,NNN(2), SSMEAN(2), SSIGMA(2), SSE(2)                          STAT
 3020   FORMAT(4H0IN ,I6,3F11.3)                                                STAT
        IF(NNN(3)-1) 177,177,178                                                DEC10
  177   NT = 2                                                                  STAT
        ICASE = 2                                                               STAT
        GO TO 180                                                               STAT
  178   SSE(3) = SSIGMA(3)/SQRT(FLOAT(NNN(3)))                                  STAT
        PRINT3010,NNN(3), SSMEAN(3), SSIGMA(3), SSE(3)                          STAT
 3010   FORMAT(5H0POST,I5,3F11.3)                                               STAT
        NT = 3                                                                  STAT
        ICASE = 3                                                               STAT
  180   CONTINUE                                                                STAT
        SE = SIGMA/SQRT(FLOAT(NN))                                              STAT
        PRINT 3030, NN, SMEAN, SIGMA, SE                                        STAT
 3030   FORMAT(4H ---,10(4H----)/4H SUM,I6,3F11.3)                              STAT
C                                                                               STAT
C       GET RID OF NEGATIVE VALUES                                              STAT
C          I  RANGES OVER ALL POINTS.                                           STAT
C          J  RANGES OVER VALID POINTS.                                         STAT
C                                                                               STAT
        J = 1                                                                   STAT
        DO 330 I=1,NOSLTS                                                       STAT
        IF(X(I)) 310,330,320                                                    STAT
  310   IF(X(I) + 2.0) 330,315,330                                              STAT
 315 X(J) = 0.0                                                         STAT
     J = J + 1                                                          STAT
     GO TO 330                                                          STAT
 320 X(J) = X(I)                                                        STAT
     J = J + 1                                                          STAT
 330 CONTINUE                                                           STAT
     CALL ACRDAN(X, NT, NNN, TM, WTV, S, GM, NDF, IER)                  STAT
     N1 = NDF(1)                                                        STAT
     N2 = NDF(2)                                                        STAT
     S1 = S(1)                                                          STAT
     S2 = S(2)                                                          STAT
     CALL FFOUT(S1,S2,N1,N2,FVAL,PRFVAL)                                STAT
     DO 193 IMS=1,3                                                     STAT
 193 XMS(IMS) = S(IMS)/NDF(IMS)                                         STAT
     PRINT 3090                                                         STAT
3090 FORMAT(1X)                                                         STAT
     PRINT 3100                                                         STAT
3100 FORMAT(28H0ANALYSIS OF VARIANCE TABLE./35H0       DF      SS       STAT
    X  MS    F /35H        ----    ----      ----   ---)                STAT
     PRINT 3200, NDF(1), S(1), XMS(1), FVAL                             STAT
3200 FORMAT(6H TREAT, I4, F10.1, F10.1, F8.3)                           STAT
     PRINT 3300, NDF(2), S(2), XMS(2)                                   STAT
3300 FORMAT(6H0ERROR, I4, F10.1, F10.1, 6H  --- /4H ---, 9(4H----))     STAT
     PRINT 3400, NDF(3), S(3), XMS(3)                                   STAT
3400 FORMAT(6H TOTAL, I4, F10.1, F10.1, 6H  --- )                       STAT
     PRINT 3800, FVAL, PRFVAL                                           STAT
3800 FORMAT(1H0,F7.3, 23H IS SIGNIFICANT AT THE  ,F5.1, 14H PERCENT LEVSTAT
    1EL)                                                                STAT
     IF(NT-2) 999,850,824                                               DEC10
 824 IF(PRFVAL - 5.0) 625,825,850                                       STAT
 825 N1 = 1                                                             STAT
     PRINT 3500                                                         STAT
3500 FORMAT(14H0CONTRAST   F )                                          STAT
     P(1) = 1                                                           STAT
     P(2) = -1                                                          STAT
     CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                           STAT
     CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                                STAT
     PRINT 3600,IP2(1), IP2(2), FVAL, PRFVAL                            STAT
3600 FORMAT(1H0, 2A4, F8.3, 23H IS SIGNIFICANT AT THE  ,F5.1,           STAT
    X15H PERCENT LEVEL.)                                                STAT
     P(1) = 0                                                           STAT
     P(2) = 1                                                           STAT
     P(3) = -1                                                          STAT
     CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                           STAT
     CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                                STAT
     PRINT 3600,IP2(3), IP2(4), FVAL, PRFVAL                            STAT
     P(1) = 1                                                           STAT
     P(2) = 0                                                           STAT
     CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                           STAT
     CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                                STAT
     PRINT 3600,IP2(5), IP2(6), FVAL, PRFVAL                            STAT
 850 CONTINUE                                                           STAT
 851 NP = 0                                                             STAT
     DO 855 I=1,NT                                                      STAT
     NCDC = NNN(I)                                                      STAT
     DO 855 J=1,NCDC                                                    STAT
     NP = NP + 1                                                        STAT
 855 ID2(NP) = I                                                        STAT
     IF(ICASE.EQ.2) GO TO 861                                           DEC10
     IF(ICASE.EQ.4) GO TO 860                                           DEC10
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      PRINT 4000                                                        STAT
 4000 FORMAT(1H0/20(4H----)/27H NON-PARAMETRIC STATISTICS.)             STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0,NT,NNN,LK)                         STAT
      CALL  KRUSWAL(X,ID1,ID2,NP,0,1,NT,NNN,LK)                         STAT
      PRINT 1100,IP2(1)                                                 STAT
 1100 FORMAT(1H0/10H0CONTRAST , A8)                                     STAT
      NP = NNN(1) + NNN(2)                                              STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0, 2,NNN,LK)                         STAT
  861 CONTINUE                                                          DEC10
      CALL  KRUSWAL(X,ID1,ID2,NP,0,1, 2,NNN,LK)                         STAT
      IF(ICASE.EQ.2) GO TO 999                                          DEC10
      NP = NNN(2) + NNN(3)                                              STAT
      IST = NNN(1) + 1                                                  STAT
      PRINT 1100,IP2(2)                                                 STAT
C     CALL  KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,0,2,NNN(2),LK)        STAT
      CALL  KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,1,2,NNN(2),LK)        STAT
      NCDC = NNN(3)                                                     STAT
      DO 880 J=1,NCDC                                                   STAT
      K = NNN(1) + J                                                    STAT
      L = NNN(2) + J                                                    STAT
      X(K) = X(L)                                                       STAT
      ID1(K) = ID1(L)                                                   STAT
  880 ID2(K) = ID2(L)                                                   STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0, 2,NNN,LK)                         STAT
  860 PRINT 1100,IP2(3)                                                 DEC10
      CALL  KRUSWAL(X,ID1,ID2,NP,0,1, 2,NNN,LK)                         STAT
  999 PRINT 1000,JOB(3)                                                 DEC10
      RETURN                                                            DEC10
  200 FORMAT(10X,F12.4,2X,2A1)                                          STAT
  300 FORMAT(13H0GRAND MEAN =,F10.3,  8H     SD =,F10.3,7H     N =,I3)  STAT
  400 FORMAT(I10,F12.4,2X,A4,2X,A2)                                     STAT
  900 FORMAT( 7H0MEAN =,F10.3,  8H     SD =,F10.3,7H     N =,I3//)      STAT
      END                                                               STAT
      SUBROUTINE MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)               MESIG
      DIMENSION LTEXT(1)                                                MESIG
      NN = 0                                                            MESIG
      SUM = 0.0                                                         MESIG
      SSQ = 0.0                                                         MESIG
      IF(NFIRST - NLAST) 10,90,90                                       MESIG
   10 DO 140 I=NFIRST,NLAST                                             MESIG
      NSLOT = 1                                                         MESIG
      CALL OTEST(I,SUM,SSQ,NN,LTEXT)                                    MESIG
  140 CONTINUE                                                          MESIG
      IF(NN.EQ.0) GO TO 90                                              DEC10
      SMEAN = SUM/NN                                                    MESIG
      SIGMA=0.                                                          DEC10
      IF(NN.EQ.1) RETURN                                                DEC10
      IF((NN*SSQ-SUM*SUM).LE.0.) RETURN                                 DEC10
      SIGMA = ((NN*SSQ - SUM*SUM)/(NN*(NN - 1)))**0.5                   MESIG
      RETURN                                                            MESIG
   90 SMEAN = 0.0                                                       MESIG
      SIGMA = 0.0                                                       MESIG
      RETURN                                                            MESIG
      END                                                               MESIG
      SUBROUTINE OTEST(I,SUM,SSQ,NN,LTEXT)                              OTEST
      DIMENSION LTEXT(1)                                                OTEST
      COMMON XDATA(100),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        REDUCE
      DATA IZ/4H0.00/, ISS/4HSKIP/, INV/4HINVL/                         OTEST
      DATA IBLANK/4H    /                                               JAN25
      IF(XDATA(I)) 310,410,510                                          OTEST
  310 IX1 = -XDATA(I) + 0.5                                                 OTEST
      IF(IXT - 2) 315,312,315                                               OTEST
  312 LTEXT(I) = IZ                                                         OTEST
      NN = NN + 1                                                           OTEST
      RETURN                                                                OTE
  315 LTEXT(I) = ISS                                                        OTE
      RETURN                                                                OTEST
  410 LTEXT(I) = INV                                                        OTEST
      RETURN                                                                OTEST
  510 NN = NN + 1                                                           OTEST
      LTEXT(I) = IBLANK                                                     OTEST
      SUM = SUM + XDATA(I)                                                  OTEST
      SSQ = SSQ + XDATA(I)*XDATA(I)                                         OTEST
      RETURN                                                                OTEST
      END                                                                   OTEST
      SUBROUTINE UERTST                                                     UERTST
      RETURN                                                                UERTST
      END                                                                   UERTST
      SUBROUTINE  STPLOT(LOOP,NOBST,NSLOT,IWORD,KSTUDY,KTYPE,KMAN,KTEST,STPLOT
     X SMEAN,SIGMA)                                                         STPLOT
      COMMON XDATA(100),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP            REDUCE
      COMMON /HITBLK/LHIT(100),MDATE(100),ISAV(16),MTVOL(100)               REDUCE
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),       STPLOT
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA               STPLOT
      DIMENSION YDATE(200),XP(3)                                            REDUCE
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3)           STPLOT
C     REAL*8 MSTUDY,MTYPE,MMAN,MTEST                                        STPLOT
      REAL   MSTUDY,MTYPE,MMAN,MTEST                                        STPLOT
      REAL KSTUDY, KTYPE, KMAN, KTEST, NITS                                 STPLOT
      DIMENSION NSMAN(7)                                                    STPLOT
      EQUIVALENCE(YDATE,T)                                                  STP
      DATA NSMAN/4,9,8,0,1,2,3/                                             STP
      IF(NOBST - 1) 911,911,1                                               STPLOT
    1 MFIRST = MDATE(1)                                                     STPLOT
      DO 10 II=1,NOBST                                                      STPLOT
      IF(MDATE(II) - MFIRST) 9,10,10                                        STPLOT
    9 MFIRST = MDATE(II)                                                    STPLOT
   10 YDATE(II) = MDATE(II)                                                 STPLOT
      J1 = NOBST + 1                                                        STPLOT
      J2 = NOBST + 2                                                        STPLOT
      CALL SCALE(XDATA, 3.0,NOBST,1)                                        STPLOT
C     XDATA(NOBST + 1) = 0.0                                                STPLOT
      IF(XDATA(J2)) 911,911,11                                              STPLOT
   11 IG = LSTUDY(1)                                                        STPLOT
      YDATE(NOBST + 1) = DATESC(1,IG)                                       STPLOT
      YDATE(NOBST + 2) = 24.0                                               STPLOT
      UP = (DATESC(2,IG) - DATESC(1,IG))/YDATE(NOBST + 2)                   STPLOT
      DOWN=(DATESC(3,IG) - DATESC(1,IG))/YDATE(NOBST + 2)                   STPLOT
      XP(1) = 0.1                                                           STPLOT
      XP(2) = 0.1+ UP                                                       STPLOT
      XP(3) = 0.1+ DOWN                                                     STPLOT
      NTIC = 3                                                              STPLOT
      CALL TEXT(LSTUDY(1), LTYPE(1), LMAN(1), LTEST(1),                     STPLOT
     X KSTUDY, KTYPE, KMAN, KTEST, NITS)                                    STPLOT
      KS = KSKIP - KSKIP/3*3                                                STPLOT
      IF(KS) 208,108,208                                                    STPLOT
C 108 CALL PLOT(4.25,10.5,-3)                                               STP
  108 CALL PLOT(8.50,10.5,-3)                                               STPL
      FPN = LTYPE(1)                                                        STPLOT
      CALL SYMBOL(0.30,-.4,0.10,KSTUDY    , 0.0, 8)                         STPLOT
      CALL SYMBOL(1.20,-.4,0.10, KTEST    , 0.0, 8)                     STPLOT
      CALL SYMBOL(2.00,-.4,0.10,4HTYPE, 0.0, 4)                         STPLOT
      CALL NUMBER(2.40,-.4,0.10,FPN,0.0,-1)                             STPLOT
      CALL SYMBOL(2.60,-.4,0.10,1WORD,0.0,10)                           STPLOT
  208 CALL PLOT(0.0,-3.5,-3).                                           STPLOT
      CALL AXIS(0.0,0.0,12H JULIAN DATE,                                STPLOT
     1   -12, 4.0,00.0,YDATF(J1),YDATE(J2),-1,4,3)                      STPLOT
C     CALL AXIS (X,Y,BCD,NC,SIZE,THETA,YMIN,DY,NDEC,NLAB,NTIC)          STPLOT
C     CALL AXIS(0.0,0.0,16H       DATA VALUE,16,3.0,  90.0, Y(J1),Y(J2)) STPLOT
      CALL AXIS(0.0,0.0,NITS    , 8,3.0,  90.0, XDATA(J1),              STPLOT
     1 XDATA(J2), -1,  4, 1)                                            STPLOT
      FPN = LMAN(1)                                                     STPLOT
      CALL SYMBOL(0.10,3.01,0.07,KMAN, 0.0, 3)                          STPLOT
      DO 308 JJ=1,3                                                     STPLOT
      KG = 4 - JJ                                                       STPLOT
      CALL NUMBER(XP(KG), 2.89, 0.07, SSMEAN(KG), 0.0, 2)               STPLOT
  308 CALL NUMBER(XP(KG), 2.77, 0.07, SSIGMA(KG), 0.0, 2)               STPLOT
      CALL PLOT(UP,0.0,3)                                               STPLOT
      CALL PLOT(UP,3.0,2)                                               STPLOT
      CALL PLOT(DOWN,3.0,3)                                             STPLOT
      CALL PLOT(DOWN,0.0,2)                                             STPLOT
  708 LL = NSMAN(LMAN(1))                                               STPLOT
      CALL LINE(YDATE,XDATA,NOBST,1, 0,LL)                              STPLOT
  811 CONTINUE                                                          STPLOT
      KSKIP = KSKIP + 1                                                 STPLOT
  911 RETURN                                                            STPLOT
      END                                                               STPLOT
      SUBROUTINE TEXT(LSTUDY,LTYPE,LMAN,LTEST,NSTUDY,NTYPE,NMAN,NTEST,  TEXT
     1 NITS)                                                            TEXT
C     REAL*8 KSTUDY,MSTUDY(6),KTEST,MURN(124),MBLD(24),MITS(124),       TEXT
      REAL   KSTUDY,MSTUDY(5),KTEST,MURN(124),MBLD(24),MITS(124),       TEXT
     1MITSB(24),KTYPE,MTYPE(15),MM,KITS                                 TEXT
      REAL NSTUDY, NTYPE, NMAN, NTEST, KMAN, MMAN(9), KITS              TEXT
      DATA MSTUDY/8HSMEAT   ,8HSKYLAB 2,8HSKYLAB 3,8HSKYLAB 4,8HAPOLLO17TEXT
     1/                                                                 TEXT
      DATA MMAN/4HCDR ,4HPLT ,4HSPT ,4HC1  ,4HC2  ,4HC3  ,4HC4  ,       TEXT
     X4HC5  ,4HC6  /                                                    TEXT
      DATA (MURN(I),I=1,107)                                            TEXT
     X          /8HEPI     ,8HNOREPI  ,8HADH     ,8HHYDRO   ,8HALDO    ,TEXT
     X8H17OH    ,8HOSMO    ,8HNA      ,8HK       ,8HMG      ,8HPO4     ,TEXT
     X8HCA      ,8HCL      ,8HH       ,8HSP.GR.  ,8HCREAT   ,8HURICACID,TEXT
     X8HB       ,8HSI      ,8HFE      ,8HAL      ,8HMO      ,8HCU      ,TEXT
     X8HZN      ,8HTI      ,8HNI      ,8HSR      ,8HCR      ,8HBL      ,TEXT
     X8HMN      ,8HLI      ,8HRB      ,8HPD      ,8HAND     ,8HETIO    ,TEXT
     X8HDHEA    ,8H11=0 AND,8H11=0ETIO,8H11OH AND,8H11OHETIO,8HTOTAL    ,TEXT
     X8HLYS     ,8HHIS     ,8HNH3     ,8HARG     ,8HHYP     ,8HASP     ,TEXT
     X8HTHR     ,8HSER     ,8HGLU     ,8HPRO     ,8HGLY     ,8HALA     ,TEXT
     X8HCYS/2   ,8HVAL     ,8HMET     ,8HILE     ,8HLEU     ,8HTYR     ,TEXT
     X8HPHE     ,8HHLYS    ,8HGAMMA-AB,8HORN     ,8HETH     ,8HNH3     ,TEXT
     X8HLYS     ,8H1-CH3HIS,8HHIS     ,8H3-CH3HIS,8HANS     ,8HTRY     ,TEXT
     X8HCRE     ,8HCAR     ,8HARG     ,8HPSER    ,8HPETN    ,8HTYR     ,TEXT
     X8HUREA    ,8HHYP     ,8HASP     ,8HTHR     ,8HSER     ,8HASP NH2 ,TEXT
     X8HGLU NN2 ,8HSAR     ,8HPRO     ,8HGLU     ,8HCIT     ,8HGLC NH2 ,TEXT
     X8HGLY     ,8HALA     ,8HALPHA-AA,8HALPHA-AB,8HVAL     ,8HCYS/2   ,TEXT
     X8HCYT     ,8HMET     ,8HILE     ,8HLEU     ,8HTYR     ,8HPHE     ,TEXT
     X8HB-ALA   ,8HB-AIB   ,8H5HIAA   ,8H        ,8H        ,8h        /JAN25
      DATA (MURN(I),I=108,124)/                                         TEXT
     X8H        ,8H        ,8H        ,8H        ,8H        ,8H        ,TEXT
     X8H        ,8H        ,8HCALORIES,8HPROTEIN ,8HDIET CA ,8HDIET P  ,TEXT
     X8HDIET NA ,8HDIET MG ,8HDIET K  ,8HDIET H20,8HWEIGHT  /           TEXT
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      DATA MBLD /8HHYDRO   ,8HALDO    ,8HHGH     ,8HANGIO   ,8HINSULIN ,TEXT
     X8HT4      ,8HACTH    ,8HADH     ,8HPTH     ,8HCAL     ,8HVIT.D.  ,TEXT
     X8HTSH     ,8HOSMO    ,8HNA      ,8HK       ,8HMG      ,8HPO4     ,TEXT
     X8HCA      ,8HCL      ,8HGLU     ,8HTP      ,8HTESTOS  ,8H        ,JAN25
     X8H        /                                                       TEX
      DATA (MITS(I),I=1,107)                                            TEX
     X          /8HUG/TV   ,8HUG/TV   ,8HMU/TV   ,8HUG/TV   ,8HUG/TV   ,TEXT
     X8HMG/TV   ,8HMOSM/TV ,8HMEG/TV  ,8HMEQ/TV  ,8HMEQ/TV  ,8HMG/TV   ,TEXT
     X8HMEQ/TV  ,8HMEQ/TV  ,8HMLO     ,8H        ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,TEXT
     X8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,TEXT
     X8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HTMG/TV  ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMMG/TV  ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMMG/TV  ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMMG/TV  ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8H        ,8H        ,8H        /JAN25
      DATA (MITS(I),I=108,124)/                                         TEXT
     X8H        ,8H        ,8H        ,8H        ,8H        ,8H        ,TEXT
     X8H        ,8H        ,8HKCAL    ,8HGRAMS   ,8HMG      ,8HMG      ,TEXT
     X8HMG      ,8HMG      ,8HMG      ,8HML      ,8HLBS.    /           TEXT
      DATA MITSB/8HUG/100ML,8HPG/ML   ,8HNG/ML   ,8HMUG/ML/H,8HUU/ML   ,TEXT
     X8HUG/100ML,8H        ,8H        ,8HPG/ML   ,8HPG/ML   ,8HNG/ML   ,TEXT
     X8H        ,8HMOSM/L  ,8HMEQ/L   ,8HMEQ/L   ,8HMG PC   ,8HMG PC   ,JAN
     X8HMG PC   ,8HMG PC   ,8HMG PC   ,8HMG PC   ,8HUG/TV   ,8H        ,JAN
     X8H        /                                                       TEXT
      NSTUDY = MSTUDY(LSTUDY)                                           TEXT
      NMAN = MMAN(LMAN)                                                 TEXT
      IF(LTEST - 400) 10,20,20                                          TEXT
   10 KTEST = MBLD(LTEST - 299)                                         TEXT
      KITS = MITSB(LTEST-299)                                           TEXT
      GO TO 30                                                          TEXT
   20 KTEST = MURN(LTEST - 399)                                         TEXT
      KITS = MITS(LTEST-399)                                            TEXT
   30 NTEST = KTEST                                                     TEXT
      NITS = KITS                                                       TEXT
      RETURN                                                            TEXT
      END                                                               TEXT
      SUBROUTINE  KRUSWAL (XY,ID1,ID2,N,NCEN,JOP,K,NU,NC)               KRUSWAL
C    THIS PROGRAM CALCULATES  A  GENERALIZED KRUSKAL-WALLIS K-SAMPLE    KRUSWAL
C    TEST. WHEN K=2, THE TEST IS EQUAL TO GEHAN@S GENERALIZED WILCOXON  KRUSWAL
C    TEST. CALCULATIONS FOLLOW THE PROCEDURES GIVEN BY MANTEL (BIOMETRICKRUSWAL
C    MARCH 1967)                                                        KRUSWAL
C                                                                       KRUSWAL
C    IN CASE OF TWO-SAMPLE, IF THE SAMPLE SIZES ARE DIFFERENT, IT IS    KRUSWAL
C    SUGGESTED TO NAME THE ONE WITH LESS OBSERVATIONS SAMPLE 1.         KRUSWAL
C     CALL NKRUSWAL(X,ID1,ID2,NALL,NC,JOP,NCOND,NUNCEN,NCEN)            KRUSWAL
C                                                                       KRUSWAL
C     X(I),I=1,NALL    ARRAY CONTAINING ALL OBS IN THE SAMPLES          KRUSWAL
C      ID1(I)=1        ITH OBS IS UNCENSORED                            KRUSWAL
C            =0        ITH OBS IS CENSORED                              KRUSWAL
C      ID2(I)=J        ITH OBS IS FROM JTH SAMPLE                       KRUSWAL
C      NALL            TOTAL NO OF OBS                                  KRUSWAL
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C      NC                 TOTAL NO OF CENSORED OBS                        KRUSWAL
C      JOP=1              PRINT INFO                                      KRUSWAL
C         =0              DO NOT PRINT                                    KRUSWAL
C      NCOND              NO OF SAMPLES                                   KRUSWAL
C      NUNCEN(I)          NO OF UNCENSORED OBS IN SAMPLE I                KRUSWAL
C      NCEN(I)            NO OF CENSORED OBS IN SAMPLE I                  KRUSWAL
      DIMENSION XY(600), ID1(600), ID2(600), NU(6), NC(6)                 KRUSWAL
      DIMENSION R1( 600),R2( 600)                                         KRUSWAL
C                                                                         KRUSWAL
C    MAXIMUM NO. OF SAMPLES = 6.                                          KRUSWAL
C    TOTAL NUMBER OF OBSERVATIONS ALLOWED = 600.                          KRUSWAL
C    K = NO. OF SAMPLES                                                   KRUSWAL
C                                                                         KRUSWAL
C                                                                         KRUSWAL
C    ORDER OBS. IN ASCENDING ORDER                                        KRUSWAL
C                                                                         KRUSWAL
      CALL SORT2(XY,N,ID1,ID2)                                            KRUSWAL
C    COMPUTATION OF R1                                                    KRUSWAL
C      STEPS 1 AND 2 : RANK FROM LEFT TO RIGHT, OMITTING RIGHT CENSOREDKRUSWAL
C                      VALUES. ASSIGN NEXT HIGHER RANK TO RIGHT           KRUSWAL
C                      CENSORED VALUES                                    KRUSWAL
C                                                                         KRUSWAL
      IRANK=0                                                             KRUSWAL
      DO 90I=1,N                                                          KRUSWAL
      IF (ID1(I).EQ.0) GO TO 101                                          KRUSWAL
      IRANK=IRANK+1                                                       KRUSWAL
      R1(I)=IRANK                                                         KRUSWAL
      GO TO 90                                                            KRUSWAL
 101  R1(I)=IRANK+1                                                       KRUSWAL
  90  CONTINUE                                                            KRUSWAL
C                                                                         KRUSWAL
C      STEP 3 : REDUCE  THE RANK OF TIED OBSERVATIONS TO THE LOWEST       KRUSWAL
C               RANK FOR THE VALUE                                        KRUSWAL
C                                                                         KRUSWAL
      K1=N-1                                                              KRUSWAL
      L1=1                                                                KRUSWAL
 12   IF (XY(L1).NE.XY(L1+1)) GO TO 11                                    KRUSWAL
      JEMP=ID1(L1)*ID1(L1+1)                                              KRUSWAL
      IF(JEMP .EQ. 0) GO TO 11                                            KRUSWAL
      R1(L1+1)=R1(L1)                                                     KRUSWAL
      IF (L1.EQ.K1) GO TO 13                                              KRUSWAL
      L1=L1+1                                                             KRUSWAL
      GO TO 12                                                            KRUSWAL
 11   IF (L1.EQ.K1) GO TO 13                                              KRUSWAL
      L1=L1+1                                                             KRUSWAL
      GO TO 12                                                            KRUSWAL
 13   CONTINUE                                                            KRUSWAL
C                                                                         KRUSWAL
C    COMPUTATION OF R2                                                    KRUSWAL
C      STEP 1 : RANK FROM RIGHT TO LEFT                                   KRUSWAL
C                                                                         KRUSWAL
      DO 14 I=1,N                                                         KRUSWAL
 14   R2(I)=N-I+1                                                         KRUSWAL
C                                                                         KRUSWAL
C      STEP 2 : REDUCE THE RANK OF TIED OBSERVATIONS TO THE LOWEST RANKKRUSWAL
C               FOR THE VALUE                                             KRUSWAL
C                                                                         KRUSWAL
      L1=N                                                                KRUSWAL
 22   IF (XY(L1).NE.XY(L1-1)) GO TO 21                                    KRUSWAL
      JEMP=ID1(L1)*ID1(L1-1)                                              KRUSWAL
      IF (JEMP .EQ. 0) GO TO 21                                         KRUSWAL
      R2(L1-1)=R2(L1)                                                   KRUSWAL
      IF (L1.EQ. 2) GO TO 23                                            KRUSWAL
      L1=L1-1                                                           KRUSWAL
      GO TO 22                                                          KRUSWAL
 21   IF (L1.EQ. 2) GO TO 23                                            KRUSWAL
      L1=L1-1                                                           KRUSWAL
      GO TO 22                                                          KRUSWAL
 23   CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C       STEP 3 : REDUCE THE RANK OF RIGHT CENSORED OBSERVATIONS TO UNITYKRUSWAL
C                                                                       KRUSWAL
      IF (NCEN .EQ. 0) GO TO 501                                        KRUSWAL
      DO 24 I=1,N                                                       KRUSWAL
      IF (ID1(I) .EQ. 1) GO TO 24                                       KRUSWAL
      R2(I)=1.                                                          KRUSWAL
 24   CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C     COMPUTE FINAL SCORES -R1(I)                                       KRUSWAL
C                                                                       KRUSWAL
 501  CONTINUE                                                          KRUSWAL
      DO 25 I=1,N                                                       KRUSWAL
 25   R1(I)=R1(I)-R2(I)                                                 KRUSWAL
      IF(JOP.NE.1) GO TO 37                                             KRUSWAL
      PRINT 30                                                          KRUSWAL
 30   FORMAT(1H0,8X,@I@,8X,@OBSERVATIONS@,8X,@SAMPLE@,6X,@SCORES@)      KRUSWAL
      DO 31 I=1,N                                                       KRUSWAL
      IF (ID1(I).EQ.0) GO TO 34                                         KRUSWAL
      PRINT 33, I,XY(I),ID2(I),R1(I)                                    KRUSWAL
      GO TO 31                                                          KRUSWAL
   34 PRINT 35, I,XY(I),ID2(I),R1(I)                                    KRUSWAL
 33   FORMAT(1H ,6X,I3,7X,F8.1,15X,I2,12X,F6.0)                         KRUSWAL
 35   FORMAT(1H ,6X,I3,7X,F8.1,1H+,14X,I2,12X,F6.0)                     KRUSWAL
 31   CONTINUE                                                          KRUSWAL
   37 PRINT 36                                                          KRUSWAL
 36   FORMAT(1H0)                                                       KRUSWAL
      IF (K.GT.2) GO TO 200                                             KRUSWAL
      CALL TWOSPL(R1,ID2,N,NU,NC)                                       KRUSWAL
      GO TO 1000                                                        KRUSWAL
 200  CALL AKSPL(K,N,R1,NU,NC,ID2)                                      KRUSWAL
 1000 CONTINUE                                                          KRUSWAL
      RETURN                                                            KRUSWAL
      END                                                               KRUSWAL
      SUBROUTINE SORT2(X,N,ID,IC)                                       SORT2
      DIMENSION X(1),ID(1),IC(1)                                        SORT2
      DO 1 I=1,N                                                        SORT2
      J=N-I+1                                                           SORT2
      JJ=J-1                                                            SORT2
      IF (JJ .LT. 1)GO TO 1                                             SORT2
      DO 2 K=1,JJ                                                       SORT2
      IF (X(K).NE.X(J)) GO TO 3                                         SORT2
      IF (ID(K)-ID(J)) 4,2,2                                            SORT2
 3    IF (X(K) .LT. X(J)) GO TO 2                                       SORT2
 4    X1=X(J)                                                           SORT2
      ITEM=ID(J)                                                        SORT2
      ICTE=IC(J)                                                        SORT2
      X(J)=X(K)                                                         SORT2
      ID(J)=ID(K)                                                       SORT2
      IC(J)=IC(K)                                                       SORT2
      X(K)=X1                                                           SORT2
      ID(K)=ITEM                                                        SORT2
      IC(K)=ICTE                                                        SORT2
    2 CONTINUE                                                          SORT2
    1 CONTINUE                                                          SORT2
      RETURN                                                            SORT2
      END                                                               SORT2
      SUBROUTINE TWOSPL(R1,ID2,N,NU,NC)                                 TWOSPL
      DIMENSION ID2(1),R1(1),NU(1),NC(1)                                TWOSPL
C     DATA ONE,TWO/@ONE@,@TWO@/                                         TWOSPL
      DATA ONE/10HONE       /                                           TWOSPL
      DATA TWO/10HTWO       /                                           TWOSPL
      WW=0.                                                             TWOSPL
      DO 26 I=1,N                                                       TWOSPL
      IF (ID2(I).EQ.2) GO TO 26                                         TWOSPL
      WW=WW+R1(I)                                                       TWOSPL
   26 CONTINUE                                                          TWOSPL
      SUM=0.                                                            TWOSPL
      DO 27 I=1,N                                                       TWOSPL
   27 SUM=SUM+R1(I)**2                                                  TWOSPL
      XN1=NU(1)+NC(1)                                                   TWOSPL
      XN2=NU(2)+NC(2)                                                   TWOSPL
      XN=N                                                              TWOSPL
      VAR=XN1*XN2*SUM/(XN*(XN-1.))                                      TWOSPL
      VAR=SQRT(VAR)                                                     TWOSPL
C                                                                       TWOSPL
C    CALCULATE CONTINUITY CORRECTION                                    TWOSPL
C                                                                       TWOSPL
      SIGN=-1.                                                          TWOSPL
      IF (WW.LT.0.) SIGN=1.                                             TWOSPL
      COR=.5                                                            TWOSPL
      IF (FLOAT((NC(1)+NC(2))/N) .LT. 0.2) COR=1.0                      TWOSPL
      COR=SIGN*COR                                                      TWOSPL
      IF (WW.EQ.0.) COR=0.                                              TWOSPL
C                                                                       TWOSPL
C    CALCULATE FINAL W SCORE AND PROBABILITY.                           TWOSPL
C                                                                       TWOSPL
      WSCORE=(WW+COR)/VAR                                               TWOSPL
      WSC=WSCORE                                                        TWOSPL
      IF (ABS(WSCORE)-3.1) 305,305,302                                  TWOSPL
  305 P1=100.*(1.-PROB(WSC))                                            TWOSPL
      GO TO 301                                                         TWOSPL
  302 P1=0.1                                                            TWOSPL
  301 CONTINUE                                                          TWOSPL
      P2=P1*2.                                                          TWOSPL
      P2=AMIN1(P2,100.)                                                 TWOSPL
      PRINT 600, WW,VAR,WSCORE                                          TWOSPL
  600 FORMAT(1H0,3X,1HW,7X,8HST. DEV.,3X,10HASYMPTOTIC/25X,6HWSCORE/1X,FTWOSPL
     19.0,F8.2,7X,F5.2)                                                 DEC10
      PRINT 601, WSCORE,P2,TWO                                          TWOSPL
      PRINT 601, WSCORE,P1,ONE                                          TWOSPL
  601 FORMAT(1X,F5.2,1X,@IS SIGNIFICANT AT THE @, F7.1,@ PERCENT LEVEL -TWOSPL
     1@,A3,@ TAILED TEST@)                                              TWOSPL
      PRINT 602                                                         TWOSPL
  602 FORMAT(1H0)                                                       TWOSPL
      RETURN                                                            TWOSPL
      END                                                               TWOSPL
      SUBROUTINE AKSPL(K,N,R1,NU,NC,ID2)                                AKSPL
      DIMENSION R1(1),NU(1),NC(1),W(6),ID2(1)                           AKSPL
C                                                                       AKSPL
C    TEST STATISTIC FOR K(GREATER THAN 2)-SAMPLE CASE                   AKSPL
```

```
C                                                                       AKSPL
      DO 201 I=1,K                                                      AKSPL
  201 W(I)=0.                                                           AKSPL
      DO 202 IJ=1,N                                                     AKSPL
      I=ID2(IJ)                                                         AKSP
  202 W(I)=W(I)+R1(IJ)                                                  AKS
      T=0.                                                              AKSPL
      DO 203 IJ=1,N                                                     AKSPL
  203 T=T+R1(IJ)**2                                                     AKSPL
      B=0.                                                              AKSPL
      PRINT 300                                                         AKSPL
  300 FORMAT(1H0,@SAMPLE@,8X,@W(I)@,10X,@N(I)@)                         AKSPL
      DO 204 I=1,K                                                      AKSPL
      UC=NU(I)+NC(I)                                                    AKSPL
      PRINT 301, I,W(I),UC                                              AKSPL
  301 FORMAT(1H ,3X,I1,7X,F8.0,7X,F5.0)                                 AKSPL
  204 B=B+(W(I)**2/UC)                                                  AKSPL
      PRINT 302, B,T                                                    AKSPL
  302 FORMAT(1H0,@B =@,F12.2,5X,@T =@,F10.0)                            AKSPL
      WSCORE=(B/T)*FLOAT(N-1)                                           AKSPL
C                                                                       AKSPL
C   WSCORE HAS CHI-SQUARE DISTRIBUTION WITH (K-1) D. F.                 AKSPL
C                                                                       AKSPL
      WS=WSCORE                                                         AKSPL
      XK=K-1                                                            AKSPL
      XM=WS/2.                                                          AKSPL
      IC=XK/2.                                                          AKSPL
      SWS=SQRT(WS)                                                      AKSPL
      EM=1./EXP(XM)                                                     AKSPL
      PRINT 205, WSCORE                                                 AKSPL
  205 FORMAT(1H0,@WSCORE = @,F7.3)                                      AKSP
      XK2=XK/2.                                                         AKS
      IF ((XK2-FLOAT(IC)).NE.0) GO TO 500                               AKSPL
      SUM=0.                                                            AKSPL
      PROD=1.                                                           AKSPL
      DO 1 I=1,IC                                                       AKSPL
      IF (I.GT.1) GO TO 2                                               AKSPL
      XI=1                                                              AKSPL
      GO TO 3                                                           AKSPL
  2   XI=I-1                                                            AKSPL
  3   PROD=XI*PROD                                                      AKSPL
      TERM=XM**(I-1)/PROD                                               AKSPL
  1   SUM=SUM+TERM                                                      AKSPL
      CPROB=SUM*EM                                                      AKSPL
      P=100.*CPROB                                                      AKSPL
      IF (P.LT.0.1000) GO TO 10                                         AKSPL
      PRINT 206, WSCORE,P                                               AKSPL
  206 FORMAT(1H0,F7.3,@ IS SIGNIFICANT AT THE @,F5.1,@ PERCENT LEVEL@)  AKSPL
      GO TO 1000                                                        AKSPL
  10  P=0.10                                                            AKSPL
      PRINT 12, WSCORE,P                                                AKSPL
  12  FORMAT(1H0,F7.3,@ IS SIGNIFICANT WITH PROBABILITY LESS THAN @,F7.3AKSPL
     1,@ PERCENT LEVEL@)                                                AKSPL
      GO TO 1000                                                        AKSPL
  500 GAMH=1.7724538509                                                 AKSPL
      TERM=SQRT(XM)/(0.5*GAMH)                                          AKSP
      SUM=TERM                                                          AKS
      NR=(XK-3.)/2.                                                     AKS
      IF(NR.EQ.0) GO TO 502                                             AKSPL
      DO 501 I=1,NR                                                     AKSPL
      X1=I                                                              AKSPL
      TERM=TERM*2.*XM/(2.*XT+1.)                                        AKSPL
 501  SUM=SUM+TERM                                                      AKSPL
 502  CHISG=(SUM*EM)*100.                                               AKSPL
      P2=100.*2.*(1.-PROB(SWS))                                         AKSPL
      P=P2+CHISG                                                        AKSPL
      IF (P.LT.0.0005) GO TO 14                                         AKSPL
      PRINT 206,  WSCORE,P                                              AKSPL
      GO TO 1000                                                        AKSPL
 14   P=0.001                                                           AKSPL
      PRINT 12,  WSCORE,P                                               AKSPL
 1000 CONTINUE                                                          AKSPL
      RETURN                                                            AKSPL
      END                                                               AKSPL
      FUNCTION PROB(X)                                                  PROB
C                                                                       PROB
C       THIS FUNCTION ROUTINE COMPUTES                                  PROB
C                     DISTRIBUTION FUNCTION(X)        IF X GE 0         PROB
C                 1 - DISTRIBUTION FUNCTION(X)        IF X LT 0         PROB
C       OF A ST. NORMAL VARIABLE USING APPROXIMATION 26.2.19  P.932     PROB
C       HANDBOOK OF MATH. FUNCTIONS                                     PROB
      DATA D1,D2,D3,D4,D5,D6/.0498673470,.0211410061,.0032776263,.000036PROB
     10036,.0000488906,.0000053830/                                     PROB
      IF (X) 20,30,40                                                   PROB
 30   PROB=0.5                                                          PROB
      RETURN                                                            PROB
 20   X1=-X                                                             PROB
      GO TO 50                                                          PROB
 40   X1=X                                                              PROB
 50   A=1.+X1*(D1+X1*(D2+X1*(D3+X1*(D4+X1*(D5+X1*D6)))))                PROB
      PROB=1.-0.5*A**(-16)                                              PROB
 60   CONTINUE                                                          PROB
      RETURN                                                            PROB
      END                                                               PROB
      SUBROUTINE FFOUT(S1, S2, N1, N2,FDAT, PRB)                        FFOUT
      FDAT = (S1/N1)/(S2/N2)                                            FFOUT
      PRB= FISH(FDAT,N1,N2)                                             FFOUT
      PRB = (1.0 - PRB)*100.                                            FFOUT
      IF(PRB - 0.1) 1,2,2                                               FFOUT
    1 PRB = 0.1                                                         FFOUT
    2 RETURN                                                            FFOUT
      END                                                               FFOUT
      FUNCTION FISH(F,N1,N2)                                            FISH
      LOGICAL E1,E2,E3                                                  FISH
       IF(N1.GE.100.AND.N2.GE.100) GOTO 9                               FISH
C-----------------------------------------------------------------------FISH
C     INITIALIZATION AND SETTING OF LOGICAL SWITCHES  TO .TRUE. IF      FISH
C     THE DEGREES OF FREEDOM ARE EVEN .                                 FISH
C-----------------------------------------------------------------------FISH
      E1=.FALSE.                                                        FISH
      E2=.FALSE.                                                        FISH
      E3=.FALSE.                                                        FISH
      IF(MOD(N1,2).EQ.0) E1=.TRUE.                                      FISH
      IF(MOD(N2,2).EQ.0) E2=.TRUE.                                      FISH
      X=N2/(N2+N1*F)                                                    FISH
      IF(.NOT.(E1.OR.E2)) GO TO 5                                       FISH
      IF(E1.AND..NOT.E2) GO TO 1                                        FISH
      IF(.NOT.E1.AND.E2) GO TO 2                                        FISH
      IF(N1.LE.N2) GO TO 1                                              FISH
C-----------------------------------------------------------------------FISH
```

```
C   INITIALIZATION FOR SECOND DEGREE OF FREEDOM EVEN  AND LESS THAN     FISH
C      FIRST DEGREE OF FREEDOM IF IT TOO IS EVEN                        FISH
C-----------------------------------------------------------------------FISH
    2 I=N1                                                              FISH
      N1=N2                                                             FISH
      N2=I                                                              FISH
      X=1.0-X                                                           FISH
      E3=.TRUE.                                                         FISH
C-----------------------------------------------------------------------FISH
C      INITIALIZATION FOR FIRST DEGREE OF FREEDOM EVEN AND LESS THAN    FISH
C   SECOND DEGREE OF FREEDOM IF IT IS EVEN                              FISH
C-----------------------------------------------------------------------FISH
    1 Y=1.0-X                                                           FISH
C-----------------------------------------------------------------------FISH
C     CALCULATION OF PROBABILITY FOR AT LEAST ONE DEGREE OF FREEDOM EVENFISH
C-----------------------------------------------------------------------FISH
      FISH=0.0                                                          FISH
      H=SQRT(X**N2)                                                     FISH
      M=N1/2-1                                                          FISH
      MCDC = M + 1                                                      FISH
      DO 3 ICDC=1,MCDC                                                  FISH
      I = ICDC - 1                                                      FISH
      FISH=FISH+H                                                       FISH
    3 H=(H*Y*(N2+2.*I))/(2.*(I+1.))                                     FISH
      IF(E3) GO TO 4                                                    FISH
C-----------------------------------------------------------------------FISH
C       ADJUST CALCULATED PROBABILITY IF ITS ONES COMPLEMENT WAS        FISH
C    CALCULATED ORIGINALLY                                              FISH
C-----------------------------------------------------------------------FISH
      FISH=1.0-FISH                                                     FISH
      RETURN                                                            FISH
    4 I=N1                                                              FISH
      N1=N2                                                             FISH
      N2=I                                                              FISH
      RETURN                                                            FISH
C-----------------------------------------------------------------------FISH
C     CALCULATION OF THE PROBABILITY FOR BOTH DEGREES OF FREEDOM ODD    FISH
C-----------------------------------------------------------------------FISH
    5 Y=1.0-X                                                           FISH
      H=.63661977*SQRT(X*Y)                                             FISH
      FISH=.63661977*ACOS(SQRT(X))                                      FISH
      IF(N2.EQ.1) GO TO 8                                               FISH
      M=N2-2                                                            FISH
      DO  6  I=1,M,2                                                    FISH
      FISH=FISH+H                                                       FISH
    6 H=H*X*(I+1)/(I+2)                                                 FISH
    8 IF(N1.EQ.1) RETURN                                                FISH
      H=H*N2                                                            FISH
      M=N1-2                                                            FISH
      DO  7  I=1,M,2                                                    FISH
      FISH=FISH-H                                                       FISH
    7 H=H*Y*(N2+I)/(I+2)                                                FISH
      RETURN                                                            FISH
    9  D1=N1                                                            FISH
       D2=N2                                                            FISH
       DT=(D1/D2)*F                                                     FISH
       DN=SQRT((2.*D2-1.)*DT)-SQRT(2.*D1-1.)                            FISH
       X=DN/SQRT(1.+DT)                                                 FISH
       FISH=PHI(X)                                                      FISH
       RETURN                                                           FISH
      END                                                               FISH
      REAL FUNCTION PHI(X)                                              PHI
C-----------------------------------------------------------------------PHI
C                                                                       PHI
C  PHI CALCULATES THE AREA UNDER THE NORMAL CURVE                       PHI
C  A TRANSFORMATION AND J-FRACTION ARE USED ( SEE METHOD )              PHI
C                                                                       PHI
C-----------------------------------------------------------------------PHI
      LOGICAL UPPER                                                     PHI
      IF(X.LT.-13.27) GO TO 6                                           PHI
      IF(X.GT.8.5) GO TO 8                                              PHI
      IF(X.NE.0.0) GO TO 2                                              PHI
      PHI=0.50                                                          PHI
      RETURN                                                            PHI
    2 UPPER=X.GT.0.0                                                    PHI
      Z=    (ABS(X))                                                    PHI
      Y= 5.6418953027302E-1* EXP(- Z*Z /2.E0)                           PHI
      Z = Z /1.4142135623731E0                                          PHI
      T=0.0E0                                                           PHI
      IF( ABS(Y/Z).GT.0.0) T=Y/(Z-6.9183675618730E-6                    PHI
     1+5.0025350900390E-1/(Z+1.2386797611409E-2+7.7267300865878E-1      PHI
     2/(Z-4.3263982143053E0 +7.3456287718055E1/(Z+1.5040871364290E1     PHI
     3+6.20862456572356E0 /(Z+8.8971612130791E0 +4.9182171845874E1      PHI
     4/(Z-2.5108230069509E0 -2.8225972942737E0/(Z-9.7597917308472E-1    PHI
     5+2.4244213526837E1 /(Z+4.8008570125081E0 +4.9227853919002E-1      PHI
     6/(Z+7.6621170927661E0 +5.0285619125788E1/(Z-4.6529284984655E0     PHI
     7  ))))))))))                                                      PHI
      T=T/2.E0                                                          PHI
      IF(UPPER) GO TO 4                                                 PHI
      PHI=T                                                             PHI
      RETURN                                                            PHI
    4 PHI=1.0E0-T                                                       PHI
      RETURN                                                            PHI
    6 PHI = 0.0                                                         PHI
      RETURN                                                            PHI
    8 PHI = 1.0                                                         PHI
      RETURN                                                            PHI
      END                                                               PHI
      SUBROUTINE ERROR                                                  ERROR
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,      ERROR
     +                MFUNC,IFILE,IERR                                  ERROR
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           ERROR
      GO TO(100,200,300,400) IFILE                                      ERROR
  100 IERR = IFETCH(FITRA1,3LIRS)                                       ERROR
      CALL STOREF(FITRA1,3LIRS,0)                                       ERROR
      GO TO 500                                                         ERROR
  200 IERR = IFETCH(FITRA2,3LIRS)                                       ERROR
      CALL STOREF(FITRA2,3LIRS,0)                                       ERROR
      GO TO 500                                                         ERROR
  300 IERR = IFETCH(FITRA3,3LIRS)                                       ERROR
      CALL STOREF(FITRA3,3LIRS,0)                                       ERROR
      GO TO 500                                                         ERROR
  400 IERR = IFETCH(FITRA4,3LIRS)                                       ERROR
      CALL STOREF(FITRA4,3LIRS,0)                                       ERROR
  500 IF(IERR.EQ.0) RETURN                                              ERROR
      PRINT 601,IFILE,IERR,KEE,KEF                                      ERROR
      RETURN                                                            ERROR
  601 FORMAT(* RA*,I1,* ERRCR *,O10,2I10)                               ERROR
      END                                                               ERROR
```

D.4 Control cards and modification deck for modifying program RETD to perform analysis of variance

```
NASARET,CM20000,T1000.                NEWTON
ACCOUNT,AN12318,.
GET,RTREVE.
GET(ANFILE)
RFL,70000.
MODIFY,F,P=RTREVE,LO=CET.
SETCORE(0)
FTN,I,L=0,PL=50000,T.
ATTACH,FTNIMSL/UN=LB12345.
GET,FTNPLT/UN=AN12005.
GET,RA1.
GET,RA2.
GET,RA3.
GET,RA4.
RFL,110000.
MODE(1)
LOAD,LGO,FTNIMSL,FTNPLT.
EXECUTE.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
EXIT.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
-
*CREATE  ANFILE
*IDENT  APR24
*DECK  STAT
*D  75
      IVV(1)=IVV(2)=IVV(3)=0
*D  108
      IF(IFIRST-ILAST)162,163,166
  163 PRINT 401
  401 FORMAT(*  SINGLE VALUE NOT ANALYZED*)
*DECK  MESIG
*D  6
      IF(NFIRST-NLAST) 10,10,90
*IDENT  SETWRK
*DECK  KRUSWAL
*D  1
      SUBROUTINE KRUSWAL(XIN,ID1,ID2IN,N,NCEN,JOP,K,NU,NC,IP2)
*D  22
      DIMENSION XIN(1),ID1(1),ID2IN(1),NU(6),NC(6),XY(120),ID2(120)
*I  28
C     MOVE INCOMMING ARRAYS TO WORK ARRAYS
      DO 10 I=1,N
      XY(I)=XIN(I)
      ID2(I)=ID2IN(I)
   10 CONTINUE
*IDENT  FIX
*DECK RETD
*D  1
      PROGRAM RETD(INPUT,OUTPUT,TAPE6=OUTPUT)
*DECK  STAT
*MODNAME  DEC10
*D  8,19
*D  23
*D  25
*D  26
      IF(ICASE.EQ.2) GO TO 998
*MODNAME STAT
```

```
*I 190
      IF(ICASE.EQ.4) 710,711
  710 IF(NNN(2).EQ.1) GO TO 712
      GO TO 713
  712 NNN1=NNN(1)+1
      NSLTM1=J-1
      DO 179 I=NNN1,NSLTM1
  179 X(I)=X(I+1)
  713 NNN(2)=NNN(3)
      NNN(3)=0
  711 CONTINUE
*I  219
      P(3)=0
*D  222,223
      PRINT 3600,IP2(1),FVAL,PRFVAL
 3600 FORMAT(1H0,A8,F8.3,23H IS SIGNIFICANT AT THE     ,F5.1,
*D  230
      PRINT 3600,IP2(2),FVAL,PRFVAL
*D  235
      PRINT 3600,IP2(3),FVAL,PRFVAL
*D  262
      L=NNN(1)+NNN(2)+J
*I 265
      NP=NNN(1)+NNN(3)
      NNN(2)=NNN(3)
*I  267
  998 CONTINUE
*IDENT FIX2
*DECK  STAT
*I  155
      NN=NN-NNN(2)
*I  165
      NN=NN-NNN(3)
*D  247
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,NT,NNN,LK,LK)
*D  252
      IPI=2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)
*D  257
      IPI=3
      CALL KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,1,2,NNN(2),LK,IPI)
*D  267
      IPI=3
      IF(ICASE.EQ.4) IPI=2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)
*DECK  KRUSWAL
*D 113
      CALL TWOSPL(R1,ID2,N,NU,NC,IP2)
*DECK  TWOSPL
*D  1
      SUBROUTINE TWOSPL(R1,ID2,N,NU,NC,IP2)
*D  8
      IF(ID2(I).EQ.IP2) GO TO 26
*IDENT  XREDUC
*DECK RETD
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTUP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
```

```
*DECK  RET
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*D  3
      IF(IH.LE.151)  GO TO 10
*D  4
      IF(NSMP.LE.150)  GO TO 35
*DECK  SETCRI
*MODNAME  REDUCE
*D  1
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*DECK  RETRVE
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*D  3
      IF(M.GT.150)  GO TO 110
*DECK  STAT
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*DECK  OTEST
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*DECK  STPLOT
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*IDENT ANOV1
*DECK  STAT
*I  6
      COMMON Y(3,3,80),N(3,3),A(4,4),B(4,4),AP(3),Q(3),W(3),V(3),WW(3),
     1VV(3),NSUMI(3),SUMYI(3),NSUMJ(3),SUMYJ(3),SUMYIJ(3,3),TAUHAT(3),
     2    BETHAT(3),THAT(3),BHAT(3)
      COMMON/AOV2NE/IDEN(8),NAMET,NAMEB,IWT,SUMSQX,TAU,MNSQT,FRATIO,
     1 IERR,ERROR,MNSQE,SST,MNSST,FSST,INT,TIN,TINT,FINT,ITHI,WITHT,
     2 WIT,NSUM,SUMSQY,SUMSQT,BETA,MNSQB,FRATB,ERRORB,MNSQBE,SSB,MNSSB,
     3 FSSB,BIN,BINT,FINB,PFRAT,PFSST,PFINT,PFRATB,PFSSB,PFINB
*I  7
      REAL MNSSB,MNSST,MNSQB,MNSQBE,MNSQT,MNSQE
      DIMENSION DEN(8)
      DIMENSION KOE(3)
      EXTERNAL TWOWT,TWOAVT,TWOAVB
*I  12
      EQUIVALENCE (IDEN,DEN)
*MODNAME  FIX
*I  10
      ITOT=JTOT=3
      IF(ICASE.EQ.2.OR.ICASE.EQ.4) ITOT=2
      IB=LMAN(1)
      K1=0
      DO 699 IT=1,ITOT
      K=N(IT,IB)=NNN(IT)
      DO 702 I=1,K
  702 Y(IT,IB,I)=X(I+K1)
      K1=K+K1
  699 CONTINUE
*MODNAME  FIX
*I   20
      IF(IB.EQ.3) 701,999
  701 MAXT=MAXB=3
      MAXT1=MAXT+1
      MAXB1=MAXB+1
      NAMET=4HTIME
      NAMEB=5HASTRO
      IWT=1
      DEN(1)=KSTUDY
      DEN(2)=KTEST
      IDEN(8)=3HALL
      IF(ICASE.EQ.2) IDEN(8)=IP2(1)
      IF(ICASE.EG.4) IDEN(8)=IP2(3)
      DO 703 J=1,JTOT
      DO 704 I=1,ITOT
      KK=N(I,J)
      PRINT 705,(Y(I,J,K),K=1,KK)
  705 FORMAT(F12.4)
  704 CONTINUE
  703 CONTINUE
      PRINT 1000,JOB(3)
      CALL ANOV2NE(MAXT,MAXB,ITOT,JTOT,A,B,AP,Q,N,W,V,WW,VV,Y,NSUMI,
     1  SUMYI,NSUMJ,SUMYJ,SUMYIJ,TAUHAT,BETHAT,THAT,BHAT,SUMIJ,MAXT1,
     2   MAXB1)
      IF(IWT.LT.0) GO TO 999
      ALPHA=.05
  797 FORMAT(/////@0 RANKED MEAN CONTRASTS(S-METHOD) ON @,A8,
     2        @ ASSUMING NO INTERACTION@/
     3        @ AT THE @,F5.3,@ SIGNIFICANCE LEVEL @///)
  798 FORMAT(@1@,8A10)
  799 FORMAT(/////@0 RANKED MEAN CONTRASTS(S-METHOD) ON @,A8,
     2        @ AT THE @,F5.3,@ SIGNIFICANCE LEVEL @///)
      WRITE(6,798) IDEN
      WRITE(6,797) NAMET,ALPHA
      CALL SCHEFE(ITOT,TAUHAT,WIT,ITHT,ALPHA,KOE,WW,TWOAVT)
      WRITE(6,799) NAMET,ALPHA
      CALL SCHEFE(ITOT,THAT,WIT,ITHT,ALPHA,KOE,WW,TWOWT)
      WRITE(6,797) NAMEB,ALPHA
      CALL SCHEFE(JTOT,BETHAT,WIT,ITHT,ALPHA,KOE,VV,TWOAVB)
      WRITE(6,799) NAMEB,ALPHA
      CALL SCHEFE(JTOT,BHAT,WIT,ITHT,ALPHA,KOE,VV,TWOWT)

-
JOB  DATE    300
STUDYEACH      3
DATE ALL
TYPE EACH      1
TEST EACH    436
END
EOF
-
JOB  DATE   3300
TEST RANGE   410   412
```

D.5 Analysis of Variance program as contained in file ANFILE

```
      SUBROUTINE ANOV2NE (MAXT,MAXB,ITOT,JTOT,A,B,P,Q,N,W,V,WW,VV,Y,        ANO
     2                   NSUMI, SUMYI,NSUMJ,SUMYJ,SUMYIJ,TAUHAT,BETHAT,THAT,  ANO
     3                   BHAT,SUMTJ,MAXT1,MAXB1)                               ANO
C                                                                              ANO
C         TWO-WAY ANALYSIS OF VARIANCE WITH UNEQUAL NUMBERS PER CELL           ANO
C                                                                              ANO
C         MODEL                                                                ANO
C                                                                              ANO
C      Y(I,J,K) = MU + TAU(I) + BETA(J) + INTERACTION(I,J) + ERROR(I,J,K)ANO
C                                                                              ANO
C                                                                              ANO
C         MODEL ASSUMING ADDITIVITY                                            ANO
C                                                                              ANO
C      Y(I,J,K) = MU + TAU(I) + BETA(J) + ERROR(I,J,K)                         ANO
C                                                                              ANO
C                                                                              ANOV
C         SUBROUTINE ARGUMENTS                                                 ANOV
C                                                                              ANOV
C IN   MAXT           MAXIMUM FIRST DIMENSION OF Y,A,N,SUMYIJ                  ANOV
C IN   MAXB           MAXIMUM SECOND DIMENSION OF Y,FIRST OF B                 ANOV
C IN   ITOT           NUMBER OF TAU EFFECTS                                    ANOV
C IN   JTOT           NUMBER OF BETA EFFECTS                                   ANOV
C      A              MAXT BY MAXT WORK ARRAY --- TAU EFFECTS  A*TAUHAT = Q    ANOV
C      B              MAXB BY MAXB WORK ARRAY ---BETA EFFECTS  B*BETHAT = P    ANOV
C      P              MAXT WORK VECTOR                                         ANOV
C      Q              MAXB WORK VECTOR                                         ANOV
C IN   N              MAXT BY MAXB (ACTUAL ITOT BY JTOT) NUMBERS OF SAMPLES    ANOV
C                                     PER CELL                                 ANOV
C      W              ITOT WEIGHTS OF TAU EFFECTS  (SEE IWT IN COMMON)         ANOV
C      V              JTOT WEIGHTS OF BETA EFFECTS (SEE IWT IN COMMON)         ANOV
C      VW             MAX(ITOT,JTOT) WORK VECTOR FOR WEIGHTS                   ANOV
C IN   Y              ITOT BY JTOT BY N(I,J) ARRAY OF DATA                     ANOV
C      NSUMI          JTOT VECTOR OF SUMS OF N(I,J) -- SUMED ON I              ANOV
C      SUMYI          JTOT VECTOR OF SUMS OF Y(I,J,K) -- SUMED ON K AND I      ANOV
C      NSUMJ          ITOT VECTOR OF SUMS OF N(I,J) -- SUMED ON J              ANOV
C      SUMYJ          ITOT VECTOR OF SUMS OF Y(I,J,K) -- SUMED ON K AND J      ANOV
C      SUMYIJ         ITOT BY JTOT ARRAY OF SUM OF Y(I,J,K) -- SUMED ON K      ANOV
C      TAUHAT         ITOT VECTOR OF ESTIMATES OF TAU EFFECTS                  ANOV
C      BETHAT         JTOT VECTOR OF ESTIMATES OF BETA EFFECTS                 ANOV
C      X1             MAX(ITOT,JTOT) WORK VECTOR                               ANOV
C           COMMON BLOCK AOV2NE ARGUMENTS                                      ANOV
C IN   IDEN           10 LENGTH VECTOR CONTAINING AOV TABLE TITLE (40 ALPHA) ANOV
C IN   NAMET          2 LENGTH VECTOR CONTAINING THE NAME OF THE TAU EFFECTS ANOV
C IN   NAMEB          2 LENGTH VECTOR CONTAINING THE NAME OF THE BETA EFFECTSANOV
C IN   IWT            IS 1, IF WEIGHTS W,V ARE TO BE 1/ITOT AND 1/JTOT, RESP.ANOV
C                        2, IF W,V AZE TO BE 1/NSUMJ(I),1/NSUMI(J),RESP.       ANOV
C                        3, IF W,V CONTAIN,ON CALL TO ANOVA2NE, THE WEIGHTS    ANOV
C                           TO BE USED                                         ANOV
C                                                                              ANOV
C     THE REMAINING COMMON BLOCK VARIABLES ARE VARIABLES CALCULATED IN        ANOV
C          ONE OF THE TWO ANALYSIS OF VARIANCE TABLES PREPARED BY ANOVA2NANOV
C                                                                              ANOV
C     AOV TABLE ONE CALCULATES WITH THE TAU EFFECTS ADJUSTED FOR UNEQUALANOV
C          CELL NUMBERS.  MNSQT,MNSQE,MNSST ARE TYPED REAL AND NOT INTEGEANOV
C                                                                              ANOV
C       S.V.                     D.F.         S.S.          M.S.        F-RATIO ANOV
C                                                                              ANOV
C       MU,BETA                  JTOT        SUMSQX                            ANOV
C                                                                              ANOV
C       TAU (ADJ.)              ITOT-1         TAU          MNSQT        FRATIO  ANOV
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
C        NO INTERACTION                                                      ANOV
C                                                                            ANOV
C        ERROR                  IERR        ERROR       MNSQE                ANOV
C        NO INTERACTION                                                      ANOV
C                                                                            ANOV
C        TAU (ADJ.)            ITOT-1        SST        MNSST       FSST     ANOV
C                                                                            ANOV
C        INTERACTION            INT          TIN        TINT        FINT     ANOV
C        EFFECT                                                              ANOV
C                                                                            ANOV
C        WITHIN CELL           ITHT         WITHT       WIT                  ANOV
C        ERROR                                                               ANOV
C                                                                            ANOV
C        TOTAL                 NSUM        SUMSQY                            ANOV
C                                                                            ANOV
C                                                                            ANOV
C     AOV TABLE TWO CALCULATES WITH THE BETA EFFECTS ADJUSTED FOR            ANOV
C        UNEQUAL CELL NUMBERS.  MNSQB,MNSQBE,MNSSB ARE TYPED REAL            ANOV
C                                                                            ANOV
C        S.V.                   D.F.        S.S.        M.S.       F-RATIO   ANOV
C                                                                            ANOV
C        MU,TAU                 ITOT        SUMSQT                           ANOV
C                                                                            ANOV
C        BETA (ADJ.)           JTOT-1        BETA       MNSQB       FRATB    ANOV
C        NO INTERACTION                                                      ANOV
C                                                                            ANOV
C        ERROR                  IERR        ERRORB      MNSQBE               ANOV
C        NO INTERACTION                                                      ANOV
C                                                                            ANOV
C        BETA (ADJ.)           JTOT-1        SSB        MNSSB      FSSB      ANOV
C                                                                            ANOV
C        INTERACTION            INT          BIN        BINT       FINB      ANOV
C        EFFECT                                                              ANOV
C                                                                            ANOV
C        WITHIN CELL           ITHT         WITHT       WIT                  ANOV
C        ERROR                                                               ANOV
C        TOTAL                 NSUM         SUMSQY                           ANOV
C                                                                            ANOV
C                                                                            ANOV
      DIMENSION Y(MAXT,MAXB,1),N(MAXT,1),NSUMI(1),NSUMJ(1),SUMYI(1)          ANOV
     2          ,Q(1),A(MAXT1,1),TAUHAT(1),XI(10,1),SUMYJ(1)                 ANOV
      DIMENSION SUMYIJ(MAXT,1),BETHAT(1),P(1),B(MAXB1,1)                     ANOV
      DIMENSION  W(1), V(1), WW(1), VV(1)                                    ANOV
      DIMENSION IDEN(8)                                                      ANOV
      DIMENSION  THAT(1), BHAT(1)                                            ANOV
      REAL MNSSB                                                             ANOV
      REAL MNSST                                                             ANOV
      REAL MNSQB,MNSQBE                                                      ANOV
      REAL MNSQT, MNSQE                                                      ANOV
      DIMENSION INIT(37)                                                     ANOV
      EQUIVALENCE (INIT(1),SUMSQX)                                           ANOV
      COMMON / AOV2NE / IDEN,NAMET,NAMEB,IWT,SUMSQX,TAU,MNSQT,FRATIO,        ANOV
     2                  IERR,ERROR,MNSQE,SST,MNSST,FSST,INT,TIN,TINT,        ANOV
     3                  FINT,ITHT,WITHT,WIT,NSUM,SUMSQY,SUMSQT,BETA,         ANOV
     4                  MNSQB,FRATB,ERRORB,MNSQBE,SSE,MNSSB,FSSB,BIN,        ANOV
     5                  BINT,FINB,PFRAT,PFSST,PFINT,PFRATB,PFSSB,PFINB       ANOV
      DO 4 I=1,37                                                            ANOV
    4 INIT(I)=0                                                              ANOV
 1008 FORMAT(////10X, A8,@ --- WEIGHTS@/(1X,6G20.7))                         ANOV
      GO TO (210,220,240),IWT                                                ANOV
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
  210 WT=1./FLOAT(ITOT)
C
C         EQUAL WEIGHTS
C
      DO 211 I=1,ITOT
  211 W(I)=WT
      WT=1./FLOAT(JTOT)
      DO 212 J=1,JTOT
  212 V(J)=WT
      GO TO 240
C
C         PROPORTIONAL WEIGHTS
C
  220 SSS=0.
      DO 222 I=1,ITOT
      WT=0.
      DO 221 J=1,JTOT
  221 WT=WT+N(I,J)
      W(I)=1./WT
  222 SSS=SSS+W(I)
      SSS=1./SSS
      DO 225 I=1,ITOT
  225 W(I)=W(I)*SSS
      SSS=0.
      DO 224 J=1,JTOT
      WT=0.
      DO 223 I=1,ITOT
  223 WT=WT+N(I,J)
      V(J)=1./WT
  224 SSS=SSS+V(J)
      SSS=1./SSS
      DO 226 J=1,JTOT
  226 V(J)=V(J)*SSS
      GO TO 240
  240 WRITE(6,1008) NAMET,(W(I),I=1,ITOT)
      WRITE(6,1008) NAMEB,(V(J),J=1,JTOT)
  250 NSUM=0
      SUMIJ=0.
      SUMSQY = 0.0
C
C          FORM SUM OF SQUARES AND SUM OF N
C                 AND SUM OF N AND OF Y OVER I
      DO 1 J = 1, JTOT
      NSUMI(J) = 0
      SUMYI(J) = 0.0
C
      DO 1 I = 1, ITOT
      NSUM = NSUM + N(I, J)
      NSUMI(J) = NSUMI(J) + N(I, J)
      SUMYIJ(I,J)=0.
      K = N(I, J)
      DO 1  IK = 1, K
      SUMSQY = SUMSQY + Y(I, J, IK) * Y(I, J, IK)
      SUMYI(J) = SUMYI(J) + Y(I, J, IK)
    1 CONTINUE
      IJTOT=ITOT*JTOT
      INT=IJTOT-ITOT-JTOT+1
      ITHT=NSUM-IJTOT
      ITOTP1 = ITOT  + 1
      JTOTP1 = JTOT + 1
      ITOT1=ITOT-1                                                      ANOV
      JTOT1=JTOT-1                                                      ANOV
      IERR=NSUM-ITOT-JTOT+1                                             ANOV
C                                                                       ANOV
C     CALCULATE AOV TABLE FOR ADJUSTED TAU EFFECTS                      ANOV
C                                                                       ANOV
C         FORM SUM OF N OVER J AND BEGIN TO FORM Q TO BE USED           ANOV
C         IN SOLUTION FOR TAU                                           ANOV
C                                                                       ANOV
      DO 2 I = 1, ITOT                                                  ANOV
      NSUMJ(I) = 0                                                      ANOV
      SUMYJ(I) = 0.0                                                    ANOV
      Q(I) = 0.0                                                        ANOV
      DO 2 J = 1, JTOT                                                  ANOV
      NSUMJ(I) = NSUMJ(I) + N(I, J)                                     ANOV
      Q(I)=Q(I) + FLOAT(N(I,J)) * SUMYI(J)/FLOAT(NSUMI(J))              ANOV
      K = N(I, J)                                                       ANOV
      DO 11  IK = 1, K                                                  ANOV
      SUMYIJ(I,J)=SUMYIJ(I,J) + Y(I,J,IK)                               ANOV
   11 SUMYJ(I) = SUMYJ(I) + Y(I, J, IK)                                 ANOV
      SUMIJ=SUMIJ + SUMYIJ(I,J)                                         ANOV
      SUMYIJ(I,J)=SUMYIJ(I,J)/FLOAT(K)                                  ANOV
    2 CONTINUE                                                          ANOV
      SUMIJ=SUMIJ/FLOAT(NSUM)                                           ANOV
      WRITE(6,3000) SUMIJ                                               ANOV
      WRITE(6,3003) NAMET                                               ANOV
      WRITE(6,3001) (SUMYJ(I),I=1,ITOT)                                 ANOV
      WRITE(6,3004) NAMET                                               ANOV
      WRITE(6,3005) (NSUMJ(I),I=1,ITOT)                                 ANOV
      WRITE(6,3003) NAMEB                                               ANOV
      WRITE(6,3001) (SUMYI(J),J=1,JTOT)                                 ANOV
      WRITE(6,3004) NAMEB                                               ANOV
      WRITE(6,3005) (NSUMI(J),J=1,JTOT)                                 ANOV
      WRITE(6,3002)                                                     ANOV
      DO 500 I=1,ITOT                                                   ANOV
      WRITE(6,3001) (SUMYIJ(I,J),J=1,JTOT)                              ANOV
  500 CONTINUE                                                          ANOV
      WRITE(6,3006)                                                     ANOV
      DO 501 I=1,ITOT                                                   ANOV
      WRITE(6,3005) (N(I,J),J=1,JTOT)                                   ANOV
  501 CONTINUE                                                          ANOV
 3000 FORMAT(@0MEAN EST @,G15.7)                                        ANOV
 3001 FORMAT(1X,10G12.4)                                                ANOV
 3002 FORMAT(@0CELL MEANS@)                                             ANOV
 3003 FORMAT(@0@, A8,@ SUMS@)                                           ANOV
 3004 FORMAT(@0@, A8,@ NUMBER SUMS@)                                    ANOV
 3005 FORMAT(1X,10I12)                                                  ANOV
 3006 FORMAT(@0CELL NUMBERS@)                                           ANOV
C                                                                       ANOV
C        CALCULATE WITHIN SUMS OF SQUARES                               ANOV
C                                                                       ANOV
      WITHT=0.                                                          ANOV
      DO 12 I=1,ITOT                                                    ANOV
      DO 12 J=1,JTOT                                                    ANOV
      K=N(I,J)                                                          ANOV
      DO 12 IK=1,K                                                      ANOV
   12 WITHT=WITHT + (Y(I,J,IK)-SUMYIJ(I,J))**2                          ANOV
      IF(ITHT.LE.0) GO TO 15                                            ANOV
      IF(WITHT.GT.0.) GO TO 112                                         ANOV
      WRITE(6,113) WITHT                                                ANOV
  113 FORMAT(@0 ***** WITHIN CELL ERROR IS @,G15.6,@ ... PROCESSING ABORANOV
     2TED ***** @)                                                      ANOV
      IWT=-1                                                            ANOV
      RETURN                                                            ANOV
  112 WIT=WITHT/FLOAT(ITHT)                                             ANOV
C                                                                       ANOV
C         FORM THE MATRIX A AND AUGMENT IT TO ASTAR, A NONSINGULAR      ANOV
C         MATRIX, IN THE FOLLOWING MANNER                               ANOV
C                                                                       ANOV
C                            A(ITOT X ITOT)      1 (ITOT X 1)           ANOV
C                ASTAR =                                                ANOV
C                            1-(1 X ITOT)        0 (1 X 1)              ANOV
C                                                                       ANOV
   15 DO 3 IR = 1, ITOT                                                 ANOV
      DO 3 IS = 1, ITOT                                                 ANOV
      A(IR, IS) = 0.0                                                   ANOV
      DO 5 J = 1, JTOT                                                  ANOV
    5 A(IR,IS) = A(IR,IS) + FLOAT(N(IR,J)*N(IS,J)) / FLOAT(NSUMI(J))    ANOV
      A(IR, IS) = -A(IR, IS)                                            ANOV
      IF(IR.EQ.IS) A(IR,IS)=FLOAT(NSUMJ(IR))+A(IR,IS)                   ANOV
    3 CONTINUE                                                          ANOV
C                                                                       ANOV
C                                                                       ANOV
      DO 7 I = 1, ITOT                                                  ANOV
      A(ITOTP1, I) = 1.0                                                ANOV
      A(I, ITOTP1) = 1.0                                                ANOV
C                                                                       ANOV
C         FINISH CALCULATION OF Q                                       ANOV
      Q(I) = SUMYJ(I) - Q(I)                                            ANOV
      X1(I,1)=Q(I)                                                      ANOV
    7 CONTINUE                                                          ANOV
C                                                                       ANOV
C         STORE 0 IN A(ITOTP1, ITOTP1)                                  ANOV
C                                                                       ANOV
      A(ITOTP1, ITOTP1) = 0.0                                           ANOV
C                                                                       ANOV
C         CALL MATRIX INVERSION SUBROUTINE ON A                         ANOV
C                                                                       ANOV
      CALL MATINV(A, ITOTP1, X1,  0, DET,MAXT1)                         ANOV
C                                                                       ANOV
C         CALCULATE TAU                                                 ANOV
C                                                                       ANOV
      DO 8 I = 1, ITOT                                                  ANOV
      TAUHAT(I) = 0.0                                                   ANOV
      DO 8 J = 1, ITOT                                                  ANOV
    8 TAUHAT(I) = TAUHAT(I) + A(I, J)*Q(J)                              ANOV
C                                                                       ANOV
      TAU = 0.0                                                         ANOV
      DO 9 I = 1, ITOT                                                  ANOV
    9 TAU = TAU + TAUHAT(I)* Q(I)                                       ANOV
C                                                                       ANOV
C         CALCULATE SUM OF SQUARES DUE TO MU AND BETA, UNADJUSTED       ANOV
C                                                                       ANOV
      SUMSQX = 0.0                                                      ANOV
      DO 10 J = 1, JTOT                                                 ANOV
   10 SUMSQX = SUMSQX + SUMYI(J) * SUMYI(J) /FLOAT(NSUMI(J))            ANOV
C                                                                       ANOV
C         AND MEAN SQUARE DUE TO TAU                                    ANOV
      MNSQT = TAU/FLOAT(ITOT1)                                          ANOV
C                                                                       ANOV
```

```
C           CALCULATE SUM OF SQUARES DUE TO ERROR                       ANOV
      ERROR = SUMSQY - SUMSQX - TAU                                     ANOV
      IF(ERROR.GT.0) GO TO 100                                          ANOV
      WRITE(6,101) ERROR                                                ANOV
  101 FORMAT(@0 ***** ERROR SUM OF SQUARES IS @,G15.6,@ ... PROCESSING AANOV
     2BORTED ***** @)                                                   ANOV
      IWT=-2                                                            ANOV
      RETURN                                                            ANOV
  100 MNSQE=ERROR/FLOAT(IERR)                                           ANOV
C                                                                       ANOV
C           FROM WHICH AN F-RATIO WITH                                  ANOV
C                   (ITOT -1) AND (NSUM - JTOT -ITOT + 1)               ANOV
C           DEGREES OF FREEDOM                                          ANOV
C                                                                       ANOV
      FRATIO = MNSQT / MNSQE                                            ANOV
      PFRAT = FISH(FRATIO,ITOT1,IERR)                                   ANOV
      WRITE(6,2009)IDEN                                                 ANOV
      WRITE (6, 2002)                                                   ANOV
      WRITE(6,2004) NAMEB,JTOT,SUMSQX                                   ANOV
      WRITE(6,2005) NAMET,ITOT1,TAU,MNSQT,FRATIO,PFRAT                  ANOV
      WRITE (6, 2006) IERR, ERROR, MNSQE                                ANOV
      SSS=0.                                                            ANOV
      SST=0.                                                            ANOV
      WT=0.                                                             ANOV
      DO 14 I=1,ITOT                                                    ANOV
      SSR=0.                                                            ANOV
      WW(I)=0.                                                          ANOV
      DO 13 J=1,JTOT                                                    ANOV
      SSR=SSR + V(J)*SUMYIJ(I,J)                                        ANOV
   13 WW(I)=WW(I) + V(J)*V(J)/FLOAT(N(I,J))                             ANOV
      WW(I)=1./WW(I)                                                    ANOV
      WT=WT + WW(I)                                                     ANOV
      SSS=SSS + WW(I)*SSR                                               ANOV
      SST=SST + WW(I)*SSR*SSR                                           ANOV
   14 THAT(I)=SSR-SUMIJ                                                 ANOV
      SST=SST - SSS*SSS/WT                                              ANOV
      MNSST=SST/FLOAT(ITOT1)                                            ANOV
      IF(ITHT.LE.0) GO TO 16                                            ANOV
      FSST=MNSST/WIT                                                    ANOV
      PFSST = FISH(FSST,ITOT1,ITHT)                                     ANOV
   16 WRITE(6,2014) NAMET,ITOT1,SST,MNSST,FSST,PFSST                    ANOV
      TIN=ERROR-WITHT                                                   ANOV
      TINT=TIN/FLOAT(INT)                                               ANOV
      IF(ITHT.LE.0) GO TO 17                                            ANOV
      FINT=TINT/WIT                                                     ANOV
      PFINT = FISH(FINT,INT,ITHT)                                       ANOV
   17 WRITE(6,2012) INT,TIN,TINT,FINT,PFINT                             ANOV
      WRITE(6,2013) ITHT,WITHT,WIT                                      ANOV
      WRITE (6, 2003) NSUM, SUMSQY                                      ANOV
      WRITE(6,2016) NAMET,(TAUHAT(I),I=1,ITOT)                          ANOV
      WRITE(6,2011) NAMET,(THAT(I),I=1,ITOT)                            ANOV
      WRITE(6,2010) NAMET,DET                                           ANOV
C                                                                       ANOV
C     CALCULATE AOV TABLE FOR ADJUSTED BETA EFFECTS                     ANOV
C                                                                       ANOV
      DO 53 IR= 1,JTOT                                                  ANOV
      DO 53 IS = 1,JTOT                                                 ANOV
      B(IR,IS) = 0.                                                     ANOV
      DO 55 J= 1, ITOT                                                  ANOV
   55 B(IR,IS) = B(IR,IS) + FLOAT(N(J,IR)*N(J,IS)) / FLOAT(NSUMJ(J))    ANOV
```

```
      B(IR,IS) = -B(IR,IS)                                              ANOV
      IF(IR.EQ.IS) B(IR,IS) = FLOAT(NSUMI(IR)) + B(IR,IS)               ANOV
   53 CONTINUE                                                          ANOV
      DO 52 J= 1,JTOT                                                   ANOV
      P(J) = 0.                                                         ANOV
      DO 52 I = 1,ITOT                                                  ANOV
      P(J) = P(J) + FLOAT(N(I,J)) * SUMYJ(I)/FLOAT(NSUMJ(I))            ANOV
   52 CONTINUE                                                          ANOV
      DO 57 J=1,JTOT                                                    ANOV
      B(JTOTP1,J) = 1.                                                  ANOV
      B(J,JTOTP1) = 1.                                                  ANOV
C                                                                       ANOV
C            FINISH CALCULATION OF P                                    ANOV
      P(J) = SUMYI(J) - P(J)                                            ANOV
      X1(J,1)=P(J)                                                      ANOV
   57 CONTINUE                                                          ANOV
      B(JTOTP1,JTOTP1) = 0.                                             ANOV
C                                                                       ANOV
C        CALL MATRIX INVERSION SUBROUTINE ON B                          ANOV
C                                                                       ANOV
      CALL MATINV(B,JTOTP1,X1,0,DET,MAXB1)                              ANOV
C                                                                       ANOV
C        CALCULATE BETA                                                 ANOV
C                                                                       ANOV
      DO 58 I = 1,JTOT                                                  ANOV
      BETHAT(I) = 0.                                                    ANOV
      DO 58 J = 1,JTOT                                                  ANOV
   58 BETHAT(I) = BETHAT(I) + B(I,J)*P(J)                               ANOV
C                                                                       ANOV
      BETA = 0.                                                         ANOV
      DO 59 J = 1,JTOT                                                  ANOV
   59 BETA = BETA + BETHAT(J)*P(J)                                      ANOV
C                                                                       ANOV
C        CALCULATE SUM OF SQUARES DUE TO MU AND TAU,UNADJUSTED          ANOV
C                                                                       ANOV
      SUMSQT = 0.                                                       ANOV
      DO 60 I = 1,ITOT                                                  ANOV
   60 SUMSQT = SUMSQT + SUMYJ(I) * SUMYJ(I) /FLOAT(NSUMJ(I))            ANOV
C                                                                       ANOV
C        CALCULATE SUM OF SQUARES DUE TO ERROR                          ANOV
      ERRORB = SUMSQY - SUMSQT - BETA                                   ANOV
C                                                                       ANOV
C        AND MEAN SQUARE DUE TO BETA                                    ANOV
      MNSQB = BETA/FLOAT(JTOT1)                                         ANOV
C                                                                       ANOV
C        AND DUE TO ERROR                                               ANOV
      IF(ERRORB.GT.0.) GO TO 160                                        ANOV
      WRITE(6,101) ERRORB                                               ANOV
      IWT=-3                                                            ANOV
      RETURN                                                            ANOV
  160 MNSQPE=ERRORB/FLOAT(IERR)                                         ANOV
C                                                                       ANOV
C        AND F-RATIO                                                    ANOV
      FRATB = MNSQB  / MNSQPE                                           ANOV
      PFRATB = FISH(FRATB,JTOT1,IERR)                                   ANOV
      WRITE(6,2009)IDEN                                                 ANOV
      WRITE(6,2002)                                                     ANOV
      WRITE(6,2004) NAMET,ITOT,SUMSQT                                   ANOV
      WRITE(6,2005) NAMEB,JTOT1,BETA,MNSQB,FRATB,PFRATB                 ANOV
      WRITE(6,2006) IERR,ERRORB,MNSQPE                                  ANOV
```

```
     WT=0.                                                             ANOV
     SSB=0.                                                            ANOV
     SSS=0.                                                            ANOV
     DO 64 J=1,JTOT                                                    ANOV
     SSR=0.                                                            ANOV
     VV(J)=0.                                                          ANOV
     DO 63 I=1,ITOT                                                    ANOV
     SSR=SSR + SUMYIJ(I,J)*W(I)                                        ANOV
  63 VV(J)=VV(J) + W(I)*W(I)/FLOAT(N(I,J))                             ANOV
     VV(J)=1./VV(J)                                                    ANOV
     WT=WT + VV(J)                                                     ANOV
     SSS=SSS + VV(J)*SSR                                               ANOV
     SSB=SSB + VV(J)*SSR*SSR                                           ANOV
  64 BHAT(J)=SSR-SUMIJ                                                 ANOV
     SSB=SSB-SSS*SSS/WT                                                ANOV
     MNSSB=SSB/FLOAT(JTOT1)                                            ANOV
     IF(ITHT.LE.0) GO TO 66                                            ANOV
     FSSB=MNSSB/WIT                                                    ANOV
     PFSSB = FISH(FSSB,JTOT1,ITHT)                                     ANOV
  66 WRITE(6,2014) NAMEB,JTOT1,SSB,MNSSB,FSSB,FFSSB                    ANOV
     BIN=ERRORB-WITHT                                                  ANOV
     BINT=BIN/FLOAT(INT)                                               ANOV
     IF(ITHT.LE.0) GO TO 65                                            ANOV
     FINB=BINT/WIT                                                     ANOV
     PFINB = FISH(FINB,INT,ITHT)                                       ANOV
  65 WRITE(6,2012) INT,BIN,BINT,FINB,PFINB                             ANOV
     WRITE(6,2013) ITHT,WITHT,WIT                                      ANOV
     WRITE(6,2003) NSUM,SUMSQY                                         ANOV
     WRITE(6,2016) NAMEB,(BETHAT(J),J=1,JTOT)                          ANOV
     WRITE(6,2011) NAMEB,(BHAT(J),J=1,JTOT)                            ANOV
     WRITE(6,2010) NAMEB,DET                                           ANOV
     RETURN                                                            ANOV
2002 FORMAT(@0@,40X,@UNBALANCED TWO-WAY ANALYSIS OF VARIANCE@///       ANOV
    21H , 18X, 2HSV, 19X, 2HDF, 19X, 2HSS, 19X, 2HMS, 20X, 1HF,        ANOV
    317X,@PROB F@)                                                     ANOV
2003 FORMAT (1H0, 10X, 5HTOTAL, 20X, I5, 15X, G15.7)                   ANOV
2004 FORMAT(1H0,10X,@MU, @, A8,13X,I5,15X,G15.7/11X,@(UNADJUSTED)@)    ANOV
2005 FORMAT(1H0,10X, A8,@ (ADJ.)@,10X,I5,15X,3(G15.7,5X),G15.7         ANOV
    2        /11X,@ASSUME ADDITIVE@)                                   ANOV
2006 FORMAT(1H0,10X,@ERROR@,20X,I5,15X,2(G15.7,5X)/11X,@ADDITIVE@)     ANOV
2009 FORMAT(1H1 ////////// 30X,8A10)                                   ANOV
2010 FORMAT (/////,1X,A8,@ EFFECT MATRIX DETERMINANT = @,G15.7)        ANOV
2011 FORMAT(////10X,@ESTIMATES OF @, A8,@  EFFECTS@/(1X,6G20.7))       ANOV
2012 FORMAT(1H0,10X,@INTERACTION@,14X,I5,15X,3(G15.7,5X),G15.7)        ANOV
2013 FORMAT(1H0,10X,@WITHIN CELL ERROR@,8X,I5,15X,2(G15.7,5X))         ANOV
2014 FORMAT(1H0,10X, A8,@(ADJ.)@,11X,I5,15X,3(G15.7,5X),G15.7          ANOV
    2        /11X,@(WEIGHTED)@)                                        ANOV
2016 FORMAT(////10X,@ESTIMATES OF @, A8,@  EFFECTS ASSUMING NO INTERACTANOV
    2ION@/(1X,6G20.7))                                                 ANOV
     END                                                               ANOV
     SUBROUTINE MATINV(A,N,B,M,DETERM,MAX)                             MATV
     DIMENSION IPIVOT(21), A(MAX, 10), B(10, 1), INDEX(21, 2),         MATV
    2                PIVOT(21)                                         MATV
     EQUIVALENCE (IROW,JROW), (ICOLUM,JCOLUM), (AMAX, T, SWAP)         MATV
C    INITIALIZATION                                                    MATV
  10 DETERM=1.0                                                        MATV
  15 DO 20 J=1,N                                                       MATV
  20 IPIVOT(J)=0                                                       MATV
  30 DO 550 I=1,N                                                      MATV
C    SEARCH FOR PIVOT ELEMENT                                          MATV
```

```
   40 AMAX=0.0                                                          MATV
   45 DO 105 J=1,N                                                      MATV
   50 IF (IPIVOT(J)-1) 60, 105, 60                                      MATV
   60 DO 100 K=1,N                                                      MATV
   70 IF (IPIVOT(K)-1) 80, 100, 740                                     MATV
   80 IF(ABS(AMAX)-ABS(A(J,K)))85,100,100                               MATV
   85 IROW=J                                                            MATV
   90 ICOLUM=K                                                          MATV
   95 AMAX=A(J,K)                                                       MATV
  100 CONTINUE                                                          MATV
  105 CONTINUE                                                          MATV
  110 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1                                   MATV
C     INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL                 MATV
  130 IF (IROW-ICOLUM) 140, 260, 140                                    MATV
  140 DETERM=-DETERM                                                    MATV
  150 DO 200 L=1,N                                                      MATV
  160 SWAP=A(IROW,L)                                                    MATV
  170 A(IROW,L)=A(ICOLUM,L)                                             MATV
  200 A(ICOLUM,L)=SWAP                                                  MATV
  205 IF(M) 260, 260, 210                                               MATV
  210 DO 250 L=1, M                                                     MATV
  220 SWAP=B(IROW,L)                                                    MATV
  230 B(IROW,L)=B(ICOLUM,L)                                             MATV
  250 B(ICOLUM,L)=SWAP                                                  MATV
  260 INDEX(I,1)=IROW                                                   MATV
  270 INDEX(I,2)=ICOLUM                                                 MATV
  310 PIVOT(I)=A(ICOLUM,ICOLUM)                                         MATV
  320 DETERM=DETERM*PIVOT(I)                                            MATV
C     DIVIDE PIVOT ROW BY PIVOT ELEMENT                                 MATV
  330 A(ICOLUM,ICOLUM)=1.0                                              MATV
  340 DO 350 L=1,N                                                      MATV
  350 A(ICOLUM,L)=A(ICOLUM,L)/PIVOT(I)                                  MATV
  355 IF(M) 380, 380, 360                                               MATV
  360 DO 370 L=1,M                                                      MATV
  370 B(ICOLUM,L)=B(ICOLUM,L)/PIVOT(I)                                  MATV
C     REDUCE NON-PIVOT ROWS                                             MATV
  380 DO 550 L1=1,N                                                     MATV
  390 IF(L1-ICOLUM) 400, 550, 400                                       MATV
  400 T=A(L1,ICOLUM)                                                    MATV
  420 A(L1,ICOLUM)=0.0                                                  MATV
  430 DO 450 L=1,N                                                      MATV
  450 A(L1,L)=A(L1,L)-A(ICOLUM,L)*T                                     MATV
  455 IF(M) 550, 550, 460                                               MATV
  460 DO 500 L=1,M                                                      MATV
  500 B(L1,L)=B(L1,L)-B(ICOLUM,L)*T                                     MATV
  550 CONTINUE                                                          MATV
C     INTERCHANGE COLUMNS                                               MATV
  600 DO 710 I=1,N                                                      MATV
  610 L=N+1-I                                                           MATV
  620 IF (INDEX(L,1)-INDEX(L,2)) 630, 710, 630                          MATV
  630 JROW = INDEX(L,1)                                                 MATV
  640 JCOLUM=INDEX(L,2)                                                 MATV
  650 DO 705 K=1,N                                                      MATV
  660 SWAP=A(K,JROW)                                                    MATV
  670 A(K,JROW)=A(K,JCOLUM)                                             MATV
  700 A(K,JCOLUM)=SWAP                                                  MATV
  705 CONTINUE                                                          MATV
  710 CONTINUE                                                          MATV
  740 RETURN                                                            MATV
      END                                                               MATV
      FUNCTION TWOAVT(EMS,JSUB,N2,ALPHA,W,II,IS)                        FUNCTS
      COMMON DUM(357),Y(729),A(4,4),B(4,4)                              FUNCTS
      TWOAVT=SQRT(EMS*JSUB*FISHIN(ALPHA,JSUB,N2)*(A(II,II)-2.*A(II,IS)  FUNCTS
     2              +A(IS,IS)))                                         FUNCTS
      RETURN                                                            FUNCTS
      END                                                               FUNCTS
      FUNCTION TWOAVB(EMS,JSUB,N2,ALPHA,W,II,IS)                        FUNCTS
      COMMON DUM(357),Y(729),A(4,4),B(4,4)                              FUNCTS
      TWOAVB=SQRT(EMS*JSUB*FISHIN(ALPHA,JSUB,N2)*(B(II,II)-2.*B(II,IS)  FUNCTS
     2              +B(IS,IS)))                                         FUNCTS
      RETURN                                                            FUNCTS
      END                                                               FUNCTS
      FUNCTION TWOWT (EMS,JSUB,N2,ALPHA,W,II,IS)                        FUNCTS
      DIMENSION W(1)                                                    FUNCTS
      TWOWT=SQRT(EMS*JSUB*FISHIN(ALPHA,JSUB,N2)*(1./W(II) + 1./W(IS)))  FUNCTS
      RETURN                                                            FUNCTS
      END                                                               FUNCTS
      SUBROUTINE SCHEFE(K,TMEANS,EMS,N2,ALPHA,KOE,W,FDUM)               SCHEFE
C                                                                       SCHEFE
C     SCHEFFE@S CONTRASTS FOR SIGNIFICANT DIFFERENCES IN MEANS          SCHEFE
C                                                                       SCHEFE
C  K=NUMBER OF MEANS TO BE TESTED   TMEANS=VECTOR OF MEANS TO BE TESTED SCHEFE
C  EMS=ERROR MEAN SQUARE (DENOMINATOR OF F TEST)                        SCHEFE
C  N2 =ERROR DEGREES OF FREEDOM                                         SCHEFE
C     FDUM IS A DUMMY EXTERNALLY DEFINED FUNCTION TO CALCULATE CONTRAST SCHEFE
C FOR STANDARD OUTPUT (K.LE.10) ALL MEANS HAVING THE SAME LINE UNDER THESCHEFE
C     STATISTACALLY THE SAME.                                           SCHEFE
      DIMENSION TMEANS(K),PRINT(20),KOE(1),W(1)                         SCHEFE
      DATA BLANK /6H      /,XLINE / 6HXXXXXX /                          SCHEFE
      ISAVE2=0                                                          SCHEFE
C RANK MEANS FROM LOW TO HIGH                                           SCHEFE
      CALL ORDERM(TMEANS,K,KOE)                                         SCHEFE
      WRITE(6,51) (KOE(I),I=1,K)                                        SCHEFE
   51 FORMAT(@ @,10(6X,I2,4X))                                          SCHEFE
      WRITE(6,53)(TMEANS(I),I=1,K)                                      SCHEFE
 53   FORMAT(1X ,10G12.6)                                               SCHEFE
C DO COMPARISONS                                                        SCHEFE
      ISTOP=K                                                           SCHEFE
 25   ISM1=ISTOP-1                                                      SCHEFE
      DO 24 I=1,20                                                      SCHEFE
 24   PRINT(I)=BLANK                                                    SCHEFE
      DO 30 I=1,ISM1                                                    SCHEFE
      ISAVE=I                                                           SCHEFE
      JSUB=ISM1-I+1                                                     SCHEFE
 29   IF(ISAVE2.EQ.I    )GO TO 31                                       SCHEFE
      RANGE = TMEANS(ISTOP)-TMEANS(I)                                   SCHEFE
      II=KOE(I)                                                         SCHEFE
      IS=KOE(ISTOP)                                                     SCHEFE
      S=FDUM(EMS,JSUB,N2,ALPHA,W,II,IS)                                 SCHEFE
      IF(RANGE-S) 34,34,30                                              SCHEFE
 30   CONTINUE                                                          SCHEFE
 31   ISTOP=ISTOP-1                                                     SCHEFE
      IF(ISTOP.EQ.1)GO TO 99                                            SCHEFE
      GO TO 25                                                          SCHEFE
 34   IF(K.LE.10)GO TO 35                                               SCHEFE
      WRITE(6,33)ALPHA,(TMEANS(KKK),KKK=ISAVE,ISTOP)                    SCHEFE
 33   FORMAT( @0 THE FOLLOWING MEANS ARE STATISTICALLY THE SAME AT THE @SCHEFE
     2     ,F5.3,@ ALPHA LEVEL@,/,(10G12.6))                            SCHEFE
      GO TO 39                                                          SCHEFE
 35   DO 37 I=ISAVE,ISTOP                                               SCHEFE
```

```
      II=2*I                                                            SCHEFE
      PRINT(II-1) = XLINE                                               SCHEFE
   37 PRINT(II) = XLINE                                                 SCHEFE
      WRITE(6,52)(PRINT(KK),KK=1,20)                                    SCHEFE
 38   IF(ISAVE.EQ.1)GO TO 99                                            SCHEFE
      ISAVE2=ISAVE                                                      SCHEFE
      GO TO 31                                                          SCHEFE
 99   RETURN                                                            SCHEFE
 52   FORMAT(@ @,20A6)                                                  SCHEFE
      END                                                               SCHEFE
       SUBROUTINE ORDERM(X,N,KOE)                                       ORDER
       DIMENSION X(N)   ,KOE(N)                                         ORDER
      NN=N                                                              ORDER
       K1=2                                                             ORDER
      DO 80 I=1,NN                                                      ORDER
   80 KOE(I)=I                                                          ORDER
    4  DO 99 I=K1,NN                                                    ORDER
       IF(X(I).LT.X(I-1)) GOTO 76                                       ORDER
   99 CONTINUE                                                          ORDER
      RETURN                                                            ORDER
   76  DO 82 K= 1,NN                                                    ORDER
      IF(X(I).LT.X(K)) GO TO 84                                         ORDER
   82 CONTINUE                                                          ORDER
   84 Z=X(I)                                                            ORDER
      KK=KOE(I)                                                         ORDER
      I1=I-1                                                            ORDER
      DO 86KJ=K,I1                                                      ORDER
      J=K+I1-KJ                                                         ORDER
      KOE(J+1)=KOE(J)                                                   ORDER
   86 X(J+1)=X(J)                                                       ORDER
      X(K)=Z                                                            ORDER
      KOE(K)=KK                                                         ORDER
      K1=I+1                                                            ORDER
       IF(K1.GT.NN) RETURN                                              ORDER
       GOTO 4                                                           ORDER
       END                                                              ORDER
       FUNCTION FISHIN(ALPHA,N1,N2)                                     FISHIN
C-----------------------------------------------------------------------FISHIN
C CALCULATES THE INVERSE @F@ VALUE GIVEN THE CONFIDENCE COEFFICIENT     FISHIN
C   ALPHA AND THE DEGREES OF FREEDOM(N).                                FISHIN
C-----------------------------------------------------------------------FISHIN
      Y1=N1                                                             FISHIN
      Y2=N2                                                             FISHIN
C-----------------------------------------------------------------------FISHIN
C  ADJUST FOR DEGREES OF FREEDOM EQUAL TO 1                             FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(N1.EQ.1)  Y1=2                                                 FISHIN
      IF(N2.EQ.1)  Y2=2                                                 FISHIN
C-----------------------------------------------------------------------FISHIN
C CALL PHINV TO GET INVERSE NORMAL VALUE OF 1.-ALPHA                    FISHIN
C-----------------------------------------------------------------------FISHIN
       X=PHINV(1.-ALPHA)                                                FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE LAMDA VALUE                                                  FISHIN
C-----------------------------------------------------------------------FISHIN
      Y=(X**2-3.)/6.                                                    FISHIN
      IC=0                                                              FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE THE INITIAL APPROXIMATION TO THE INVERSE @F@ FUNCTION        FISHIN
C-----------------------------------------------------------------------FISHIN
```

```
      Y1=1./(Y1-1.)                                                     FISHIN
      Y2=1./(Y2-1.)                                                     FISHIN
      H=2./(Y1+Y2)                                                      FISHIN
      X=X*SQRT(H+Y)/H-(Y1-Y2)*(Y+5./6.-2./(3.*H))                       FISHIN
      X=EXP(2.*X)                                                       FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE THE CONSTANT TO THE 'F' DISTRIBUTION,TESTING FOR N1 AND/OR N2FISHIN
C   ODD OR EVEN.                                                        FISHIN
C-----------------------------------------------------------------------FISHIN
      G=1.                                                              FISHIN
      IB1=2                                                             FISHIN
      IF(MOD(N1,2).EQ.0) GO TO 1                                        FISHIN
      G=1.7724539                                                       FISHIN
      IB1=1                                                             FISHIN
    1 IB2=2                                                             FISHIN
      IF(MOD(N2,2).EQ.0) GO TO 2                                        FISHIN
      G=G*1.7724539                                                     FISHIN
      IB2=1                                                             FISHIN
    2 IB3=2                                                             FISHIN
      IF(MOD(N1+N2,2).EQ.0) GO TO 3                                     FISHIN
      G=G/1.7724539                                                     FISHIN
      IB3=1                                                             FISHIN
    3 IF((IB1+IB2).NE.2)  G=2.*G                                        FISHIN
      IF((N1+N2).LE.3)  GO TO 5                                         FISHIN
      ND=N1+N2-2-IB3                                                    FISHIN
      ND1 = ND + 1                                                      FISHIN
      DO 4 II=1,ND1,2                                                   FISHIN
      I = II - 1                                                        FISHIN
      IF((IB1+I).LE.(N1-2))  G=G*(IB1+I)                                FISHIN
      IF((IB2+I).LE.(N2-2))  G=G*(IB2+I)                                FISHIN
    4 G=G/(IB3+I)                                                       FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE THE VALUE OF FISHIN                                          FISHIN
C-----------------------------------------------------------------------FISHIN
    5 Y2=N2/(N2+N1*X)                                                   FISHIN
      Y1=1.-Y2                                                          FISHIN
      Y=1.+(G*(1.-ALPHA-FISH(X,N1,N2)))/SQRT(Y1**N1*Y2**N2)             FISHIN
      FISHIN=X*Y                                                        FISHIN
C-----------------------------------------------------------------------FISHIN
C  IF FISHIN IS NEGATIVE, RESET FISHIN TO .5*LAST APPROXIMATION(X).     FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(Y.LT.0.)  FISHIN=.5*X                                          FISHIN
C-----------------------------------------------------------------------FISHIN
C  IF THE ABSOLUTE VALUE OF THE DIFFERENCE IS LESS THAN .5E-6, RETURN   FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(ABS(X/FISHIN-1.).LT.(.5E-6))  GO TO 7                          FISHIN
C-----------------------------------------------------------------------FISHIN
C  IF THE RELATIVE VALUE OF THE DIFFERENCE IS LESS THAN .5E-6, RETURN   FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(ABS(X-FISHIN).LT.(.5E-6)) GO TO 7                              FISHIN
      IC=IC+1                                                           FISHIN
      IF(IC.GT.100)  RETURN                                             FISHIN
C-----------------------------------------------------------------------FISHIN
C  SET THE APPROXIMATION EQUAL TO FISHIN AND CONTINUE TO ITERATE        FISHIN
C-----------------------------------------------------------------------FISHIN
      X=FISHIN                                                          FISHIN
      GO TO 5                                                           FISHIN
    7 RETURN                                                            FISHIN
      END                                                               FISHIN
      FUNCTION PHINV( P )                                               PHINV
      IF(P .EQ. 1.0)GO TO 98                                            PHINV
      IF(P .EQ. 0.0)GO TO 97                                            PHINV
      IF(P .GT. 1.0)GO TO 88                                            PHINV
      IF(P .LT. 0.0)GO TO 88                                            PHINV
      K = 1                                                             PHINV
      IF(P .GT. 0.5)GO TO 47                                            PHINV
    8 T3=SQRT(-2.0*ALOG(P))                                             PHINV
      T4P=2.515517+.802853*T3+.010328*T3*T3                             PHINV
      T5P=1.0+1.432788*T3+.189269*T3*T3+.001308*T3*T3*T3                PHINV
      XT=T3-T4P/T5P                                                     PHINV
      XT=-XT                                                            PHINV
   13 DO 53 I=1,100                                                     PHINV
      PHP = EXP(-0.5*XT*XT)                                             PHINV
      PT = PHI (XT)                                                     PHINV
      IF(ABS(P-PT) .LT. P*4.0E-8)GO TO 99                               PHINV
      Z = (P-PT)*2.50662827 / PHP                                       PHINV
      XT = XT + Z                                                       PHINV
   53 CONTINUE                                                          PHINV
      GO TO 99                                                          PHINV
   47  P = 1.0 - P                                                      PHINV
      K = 2                                                             PHINV
      GO TO 8                                                           PHINV
   99 GO TO (26,27),K                                                   PHINV
   26 PHINV = XT                                                        PHINV
      RETURN                                                            PHINV
   27 PHINV = -XT                                                       PHINV
      P = 1.0 - P                                                       PHINV
      RETURN                                                            PHINV
   98 PHINV = 1.0E+38                                                   PHINV
      RETURN                                                            PHINV
   97 PHINV = -1.0E+38                                                  PHINV
      RETURN                                                            PHINV
   88 WRITE(6,10) P                                                     PHINV
   10 FORMAT(1H0,5X,29HARGUMENT NOT A PROBABILITY = ,5X,E14.7   )       PHINV
      RETURN                                                            PHINV
      END                                                               PHINV
```

D.6 Program RETD as modified to perform the basic analysis plus an analysis of variance

```
      PROGRAM RETD(INPUT,OUTPUT,TAPE6=OUTPUT)                              FIX
C     MAIN PROGRAM                                                         RETD
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP           XREDUC
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(246),INDX3(124)             RETD
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVCL(150)              XRED
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),      RETD
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMF,NDATA              RETD
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3),SSE(3)RETD
      COMMON /SISBUF/ IBUF(35),IBL(125),IOR(35),IBUFF(30),KEY,KYE,         RETD
     +                MFUNC,IFILE,IERR                                     RETD
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)              RETD
C     START,LAUNCH,SPLASH DOWN                                             JAN25
      DATA DATESC/160.,208.,265.,114.,144.,172.,189.,209.,268.,            DEC10
     X 283.,320.,404.,  290.,342.,354./                                    DEC10
C     SL4 SPLASH DOWN IS 39  FEB 8 1974                                    DEC10
      IOPLOT = 0                                                           RETD
      KSKIP = 0                                                            RETD
C     IFFF IS LOOP CONTROL TO ALLOW OVERLAY                                JAN25
      IFFF = -1                                                            RETD
    1 CALL RET                                                             RETD
      CALL STAT                                                            RETD
      GO TO 1                                                              RETD
      END                                                                  RETD
      SUBROUTINE LINE(X,Y,N,M,I,IL)                                        LINE
C     X IS THE DATE. (INDEPENDENT VARIABLE)                                LINE
C     Y IS THE DATA. (DEPENDENT VARIABLE)                                  LINE
C     IFLAG = 13   LAST POINT NOT VALID                                    LINE
C     JFLAG = 13   LAST POINT VALID                                        LINE
C     ISFLAG IS THE NUMBER OF POINTS PLOTED.                               LINE
      DIMENSION X(1), Y(1)                                                 LINE
      DATA D/0.04/                                                         LINE
      IFLAG = 0                                                            LINE
      JFLAG = 0                                                            LINE
      ISFLAG = 0                                                           LINE
      IP = 3                                                               LINE
      IF(N - 1) 9,1,1                                                      LINE
    1 DO 6 I=1,N                                                           LINE
      II = I*M - M + 1                                                     LINE
      XP = (X(II) - X(N + M))/X(N + 2*M)                                   LINE
      YP = (Y(II) - Y(N + M))/Y(N + 2*M)                                   LINE
C     CHECK TO SEE IF POINT VALUE IS VALID.                                LINE
      IF(Y(II)) 3,13,23                                                    LINE
    3 IY = -Y(II) + 0.5                                                    LINE
      IF(IY - 2) 13,14,13                                                  LINE
C     THIS IS ZERO ON THE GRAPH.                                           LINE
   14 YP = -Y(N+1)/Y(N+2*M)                                                LINE
      GO TO 23                                                             LINE
C     INVALID POINT.                                                       LINE
   13 IFLAG = 13                                                           LINE
      GO TO 6                                                              LINE
C     VALID POINT.  CHECK FOR CONTINUOUS DATE.                             LINE
   23 JFLAG = 13                                                           LINE
      IF(ISFLAG) 25,25,24                                                  LINE
   24 IF(X(II) - X(II-M) - 1.5) 25,35,35                                   LINE
   25 IF(IFLAG) 35,26,35                                                   LINE
C     PLOT THIS PEN DOWN.                                                  LINE
   26 CALL PLOT(XP,YP,IP)                                                  LINE
      ISFLAG = ISFLAG + 1                                                  LINE
      IP = 2                                                               LINE
      GO TO 6                                                              LINE
```

```
C     DISCONTINUOUS GRAPH, PLOT AN X ON EACH END OF LINE.                 LINE
   35 CALL WHERE(U,V,F)                                                   LINE
      IFLAG = 0                                                           LINE
      KFLAG = JFLAG*ISFLAG                                                LINE
      IF(KFLAG) 16,17,16                                                  LINE
   16  CALL SYMBOL(U,V,D,LL,0.0,-1)                                       LINE
      ISFLAG = ISFLAG + 1                                                 LINE
   17 CALL SYMBOL(XP,YP,D,L1,0.0,-1)                                      LINE
      IP = 2                                                              LINE
      ISFLAG = ISFLAG + 1                                                 LINE
    6 CONTINUE                                                            LINE
      KFLAG = IFLAG*JFLAG                                                 LINE
      IF(KFLAG) 5,9,29                                                    LINE
   29 CALL WHERE(U,V,F)                                                   LINE
      CALL SYMBOL(U,V,D,LL,0.0,-1)                                        LINE
      ISFLAG = ISFLAG + 1                                                 LINE
    9 RETURN                                                              LINE
      END                                                                 LINE
      SUBROUTINE AXIS (X,Y,BCD,NC,SIZE,THETA,YMIN,DY,NDEC,NLAB,NTIC)      AXIS
      DIMENSION G(2), H(11)                                               AXIS
      DATA G/.8,.56/                                                      AXIS
      DATA H/.56,.4,.28,.2,.14,.1,.07,.05,.035,.025,.0175/                AXIS
      AC = NC                                                             AXIS
      SIG=SIGN(1.0,AC)                                                    AXIS
    2 NAC=IABS(NC)                                                        AXIS
      TH=THETA*0.017453294                                                AXIS
      IF(NLAB.LE.0) NLAB = 1                                              AXIS
      IF(NTIC.LE.0) NTIC = 1                                              AXIS
      FNLAB = NLAB                                                        AXIS
      N = SIZE*FNLAB + 0.1                                                AXIS
C     N = SIZE + 0.50                                                     AXIS
      CTH = COS  (TH)                                                     AXIS
      STH = SIN  (TH)                                                     AXIS
      CTN = CTH/FNLAB                                                     AXIS
      STN = STH/FNLAB                                                     AXIS
      TN = N                                                              AXIS
      N1 = N + 1                                                          AXIS
      N2 = NJ/2                                                           AXIS
      ADY=ABS(DY/FNLAB)                                                   AXIS
C     ADY=ABS(DY)                                                         AXIS
      STAT=YMIN                                                           AXIS
      EXP = 0.0                                                           AXIS
      IF ( ADY ) 9,18,9                                                   AXIS
    9 IF ( ADY -100.0 ) 10,12,12                                          AXIS
   12 ADY = ADY / 10.0                                                    AXIS
      STAT=STAT/10.0                                                      AXIS
      EXP = EXP + 1.0                                                     AXIS
      GO TO 9                                                             AXIS
   14 ADY = ADY * 10.0                                                    AXIS
      STAT=STAT*10.0                                                      AXIS
      EXP = EXP - 1.0                                                     AXIS
   10 IF ( ADY - 1.00 ) 14,18,18                                          AXIS
C  10 IF ( ADY - 0.01 ) 14,18,18                                          AXIS
C  18 XA = X  - (.20 * SIG  - .05) *STH - .0857 * CTH                     AXIS
   18 XA = X  - (H(NLAB+1)  * SIG  - H(NLAB+5)) *STH - .0857 * CTH        AXIS
C     YA = Y  + (.20 * SIG  - .05) * CTH - .0857 * STH                    AXIS
      YA = Y  + (H(NLAB+1) * SIG  - H(NLAB+5)) * CTH - .0857 * STH        AXIS
      I = 0                                                               AXIS
   25 I = I + 1                                                           AXIS
C     CALL NUMBER (XA,YA,0.1,STAT,THETA,2)                                AXIS
```

```
      CALL NUMBER (XA,YA,H(NLAB+3),STAT,THETA,NDEC)                    AXIS
      STAT=STAT+SIGN(ADY,DY)                                           AXIS
C     XA = XA + CTH                                                    AXIS
      XA = XA + CTN                                                    AXIS
C     YA = YA + STH                                                    AXIS
      YA = YA + STN                                                    AXIS
      IF(I - N2) 25,31,26                                              AXIS
   26 IF(I - N1) 25,60,60                                              AXIS
   31 TNC = NAC + 7                                                    AXIS
C     XC = Y + (SIZE / 2.0 -.06 * TNC)*CTH - (-.07 + SIG *.36)* STH    AXIS
      XC = X + (SIZE / 2.0 -H(NLAB+4) * TNC)*CTH                       AXIS
     1- (-H(NLAB+4) + SIG *(H(NLAB) + H(NLAB+3)))* STH                 AXIS
C     YC = Y + (SIZE / 2.0 -.06 * TNC)*STH + (-.07 + SIG *.36)* CTH    AXIS
      YC = Y + (SIZE / 2.0 -H(NLAB+4) * TNC)*STH                       AXIS
     1+ (-H(NLAB+4) + SIG *(H(NLAB) + H(NLAB+3)))* CTH                 AXIS
C     CALL SYMBOL (XC,YC,0.14,BCD,THETA,NAC)                           AXIS
      CALL SYMBOL (XC,YC,H(NLAB+2),BCD,THETA,NAC)                      AXIS
      XC = XC +((TNC -6.0) * 0.12)* CTH                                AXIS
      YC = YC +((TNC -6.0) * 0.12)* STH                                AXIS
      IF (EXP) 35,50,35                                                AXIS
C  35 CALL SYMBOL (XC,YC,0.14,@(X10   )@ ,THETA,7)                     AXIS
C  35 CALL SYMBOL (XC,YC,H(NLAB+2),@(X10   )@ ,THETA,7)                AXIS
   35 CALL SYMBOL (XC,YC,H(NLAB+2),7H(X10   ),THETA,7)                 AXIS
C     XC = XC + .48 * CTH  -.07 * STH                                  AXIS
      XC=XC+.38*CTH-H(NLAB+4)*STH                                      DEC10
C     YC = YC + .48 * STH  +.07 * CTH                                  AXIS
      YC=YC+.38*STH+H(NLAB+4)*CTH                                      DEC10
C  40 CALL NUMBER (XC,YC,0.10,EXP,THETA,-1)                            AXIS
   40 CALL NUMBER (XC,YC,H(NLAB+3),EXP,THETA,-1)                       AXIS
   50 GO TO 25                                                         AXIS
   60 FNTIC = NTIC                                                     AXIS
      NT = N*NTIC                                                      AXIS
      TN = NT                                                          AXIS
      CTH = CTN/FNTIC                                                  AXIS
      STH = STN/FNTIC                                                  AXIS
      XB = X + TN*CTH                                                  AXIS
      YB = Y + TN*STH                                                  AXIS
      XDELT = - H(6 - NTIC) * SIG  * STH                               AXIS
      YDELT = H(6 - NTIC) * SIG  * CTH                                 AXIS
      XA = XB + XDELT + XDELT                                          AXIS
C     XA = XB- 0.1 * SIG  * STH                                        AXIS
      YA = YB + YDELT + YDELT                                          AXIS
C     YA = YB+ 0.1 * SIG  * CTH                                        AXIS
      CALL PLOT (XA,YA,3)                                              AXIS
      XA = XA - XDELT                                                  AXIS
      YA = YA - YDELT                                                  AXIS
C     DO 20  I =1,M                                                    AXIS
      DO 20  I =1,N                                                    AXIS
      DO 20 II =1,NTIC                                                 AXIS
      IF(II.LT.NTIC) GO TO 45                                          AXIS
      XX = XDELT                                                       AXIS
      YY = YDELT                                                       AXIS
      GO TO 46                                                         AXIS
   45 XX = 0.                                                          AXIS
      YY = 0.                                                          AXIS
   46 CONTINUE                                                         AXIS
      CALL PLOT (XB,YB,2)                                              AXIS
      XC = XB - CTH                                                    AXIS
      YC = YB - STH                                                    AXIS
      CALL PLOT (XC,YC,2)                                              AXIS
```

```
C     XA = XA - CTH                                                     AXIS
      XA = XA - CTH + XX                                                AXIS
C     YA = YA - STH                                                     AXIS
      YA = YA - STH + YY                                                AXIS
      CALL PLOT (XA,YA,2)                                               AXIS
      XA = XA - XX                                                      AXIS
      YA = YA - YY                                                      AXIS
      XB = XC                                                           AXIS
   20 YB = YC                                                           AXIS
      RETURN                                                            AXIS
      END                                                               AXIS
      SUBROUTINE SCALE (X,S,N,K)                                        SCALE
C                                                                       SCALE
C  WHERE-   X  IS THE NAME OF THE ARRAY OF DATA TO BE SCANNED FOR MAXIMUMSCALE
C              AND MINIMUM VALUES. AN ADJUSTED MINIMUM VALUE WILL BE    SCALE
C              STORED IN X(N*K+1). AN ADJUSTED DX(MAX.-MIN.) WILL BE    SCALE
C              STORED IN X(N*K+K+1).                                    SCALE
C           S  IS THE LENGTH OVER WHICH THIS DATA IS TO BE PLOTTED.     SCALE
C           N  IS THE NUMBER OF DATA POINTS IN THE ARRAY X.             SCALE
C           K  IS THE REPEAT CYCLE OF A MIXED ARRAY.(NORMALLY 1)        SCALE
C                                                                       SCALE
      DIMENSION X(2)                                                    SCALE
      IT = 13                                                           SCALE
      NP = N * K                                                        SCALE
      L = NP + 1                                                        SCALE
      J = NP +K + 1                                                     SCALE
C     XMAX = X(1)                                                       SCALE
C     X(L) = X(1)                                                       SCALE
      DO 2 I=1,NP,K                                                     SCALE
      IF(X(I)) 2,2,3                                                    SCALE
    2 CONTINUE                                                          SCALE
    3 XMAX = X(1)                                                       SCALE
C     X(L)= X(I)                                                        SCALE
      X(L)= 0.0                                                         SCALE
      DO 10 I = 1,NP,K                                                  SCALE
      IF(X(I)) 22,10,23                                                 SCALE
   22 ITEST = 2.5 - X(I)                                                SCALE
      IF(ITEST) 10,24,10                                                SCALE
   24 X(L) = 0.0                                                        SCALE
      IT = 0                                                            SCALE
      GO TO 10                                                          SCALE
   23 IF (XMAX-X(I)) 5,6,6                                              SCALE
    5 XMAX = X(I)                                                       SCALE
    6 IF (X(L)-X(I))10,10,7                                             SCALE
    7 X(L) = X(I)                                                       SCALE
   10 CONTINUE                                                          SCALE
      DX = (XMAX - X(L)) /S                                             SCALE
      IF (DX) 31,31,30                                                  SCALE
   31 X(J) = 1.0                                                        SCALE
      X(L) = X(L) - 0.5                                                 SCALE
      RETURN                                                            SCALE
   30 IDX = ALOG10 (DX)                                                 SCALE
      IXMN = X(L) * 10.0 ** (-IDX)                                      SCALE
      IF (X(L))32,33,34                                                 SCALE
   32 IXMN = X(L) * 10.0 ** (-IDX) - 0.99                               SCALE
   34 X(L) = IXMN                                                       SCALE
      X(L) = X(L) * 10.0 ** IDX                                         SCALE
   33 DX = ALOG10 ((XMAX-X(L))/S)                                       SCALE
      IDX = DX                                                          SCALE
      XMAX = IDX                                                        SCALE
      DX=10.0**(DX-XMAX)                                                SCALE
      XMAX = 1.0                                                        SCALE
   41 IF (DX-1.0) 40,20,11                                              SCALE
   40 DX = DX * 10.0                                                    SCA
      IDX = IDX - 1                                                     SCAL
      GO TO 41                                                          SCALE
   11 XMAX=2.0                                                          SCALE
      IF(DX-2.0) 20,20,12                                               SCALE
   12 XMAX = 4.0                                                        SCALE
      IF (DX-4.0) 20,20,13                                              SCALE
   13 XMAX=5.0                                                          SCALE
      IF(DX-5.0) 20,20,14                                               SCALE
   14 XMAX=8.0                                                          SCAL
      IF (DX-8.0) 20,20,15                                              SCAL
   15 XMAX=10.0                                                         SCAL
   20 X(J) = XMAX * 10.0 ** IDX                                         SCALE
      IF(IT) 49,49,39                                                   SCALE
   39 CONTINUE                                                          SCALE
      IMAX = XMAX + 0.00001                                             SCALE
      IXMN = X(L) * 10.0 ** (-IDX)                                      SCALE
      IMOD = IXMN/IMAX*IMAX                                             SCALE
      X(L) = IMOD                                                       SCALE
      X(L) = X(L) * 10.0 ** IDX                                         SCALE
      GO TO 59                                                          SCALE
   49 CONTINUE                                                          SCALE
      X(L) = 0.0                                                        SCALE
   59 CONTINUE                                                          SCALE
      RETURN                                                            SCALE
      END                                                               SCAL
      SUBROUTINE RET                                                    RET
C                                                                       RET
C MSC ENDOCRINE DATA RETREIVAL PROGRAM                                  RET
C     FIRST LOOK STATISTICS PROGRAM.                                    RET
C                                                                       RET
      COMMON XDATA(150),T(200),IOPLUT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XREDUC
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RET
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)           XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   RET
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           RET
C     COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      RET
      COMMON /SISBUF/ JBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      RET
     +                MFUNC,IFILE,IERR                                  RET
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           RET
      DIMENSION IBUF(14)                                                RET
      EQUIVALENCE(IBUF,T)                                               RET
      EXTERNAL ERROR                                                    RET
C                                                                       RET
C RA1=SAMPLE DIRECTORY  ***  RA2=URINE FILE  ***  RA3=BLOOD FILE        RET
C                       ***  RA4=DAILY FILE  ***                        RET
C                                                                       RET
C                                                                       RET'
C PLACE KEYED FILES IN UPDATE MODE EXCLUDING @RA1@ WHICH IS             RET
C             TO BE USED AS A SEQUENTIAL SEARCH FILE                    RET
C             ASSIGNED TO FORTRAN UNIT NO. 1                            RET
C                                                                       RET
      IF(IFFF) 31,201,140                                               RET
C  31 CALL RANDOM(4,@RA2@,125,5,7,100 ,100 ,ICODE,LOC)                  RET
   31 CONTINUE                                                          RET
      CALL FILEIS(FITRA1,3LLFN,3LRA1,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +            ,3LMRL, 350,3LMNR, 350,3LWSA, T)                      RET
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      CALL STOREF(FITRA1,3LFRL,20)                                      RET
      CALL STOREF(FITRA1,2LFX,   ERROR)                                 RET
      CALL OPENM(FITRA1,3LI-O)                                          RET
      CALL REWND(FITRA1)                                                RET
      CALL FILEIS(FITRA2,3LLFN,3LRA2,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +               ,3LMRL,1250,3LMNR,1250,3LWSA, T)                   RET
      CALL STOREF(FITRA2,3LFRL,0)                                       RET
      CALL STOREF(FITRA2,2LFX,   ERROR)                                 RET
      CALL OPENM(FTTRA2,5LINPUT)                                        RET
      CALL REWND(FITRA2)                                                RET
      CALL FILEIS(FITRA3,3LLFN,3LRA3,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +               ,3LMRL, 350,3LMNR, 350,3LWSA, T)                   RET
      CALL STOREF(FITRA3,3LFRL,0)                                       RET
      CALL STOREF(FITRA3,2LFX,   ERROR)                                 RET
      CALL OPENM(FITRA3,5LINPUT)                                        RET
      CALL REWND(FITRA3)                                                RET
      CALL FILEIS(FITRA4,3LLFN,3LRA4,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +               ,3LMRL, 300,3LMNR, 300,3LWSA,T)                    RET
      CALL STOREF(FITRA4,3LFRL,0)                                       RET
      CALL STOREF(FITRA4,2LFX,   ERROR)                                 RET
      CALL OPENM(FITRA4,5LINPUT)                                        RET
      CALL REWND(FITRA4)                                                RET
      IFFF = 0                                                          RET
C                                                                       RET
C INITIALIZE COUNTER FLAGS FOR THE FIRST PASS OF                        RET
C     ANY GIVEN RETREIVAL                                               RET
C                                                                       RET
  201 ISFLG = 1                                                         RET
      IDFLG = 1                                                         RET
      IMFLG = 1                                                         RET
      ITPFLG = 1                                                        RET
      ITTFLG = 1                                                        RET
      IFFF = 1                                                          RET
C                                                                       RET
C READ ONE DATA CARD                                                    RET
C                                                                       RET
    1 READ 200,(ISAV(I),I=1,16)                                         RET
  200 FORMAT(A4,1X,A4,1X,14I5)                                          RET
C                                                                       RET
C DETERMINE CARD TYPE AND COUNTER SEQUENCE                              RET
C                                                                       RET
      IF(ISAV(1).EQ.4HJOB ) GO TO 19                                    RET
      IF(ISAV(1).EQ.4HSTUD.AND.ISFLG.EQ.1) GO TO  5                     RET
      IF(ISAV(1).EQ.4HSTUD.AND.ISFLG.EQ.0) GO TO 45                     RET
      IF(ISAV(1).EQ.4HDATE.AND.IDFLG.EQ.1) GO TO  6                     RET
      IF(ISAV(1).EQ.4HDATE.AND.IDFLG.EQ.0) GO TO 46                     RET
      IF(ISAV(1).EQ.4HMAN .AND.IMFLG.EQ.1) GO TO  7                     RET
      IF(ISAV(1).EQ.4HMAN .AND.IMFLG.EQ.0) GO TO 47                     RET
      IF(ISAV(1).EQ.4HTYPE.AND.ITPFLG.EQ.1) GO TO  8                    RET
      IF(ISAV(1).EQ.4HTYPE.AND.ITPFLG.EQ.0) GO TO 48                    RET
      IF(ISAV(1).EQ.4HTEST.AND.ITTFLG.EQ.1) GO TO  9                    RET
      IF(ISAV(1).EQ.4HTEST.AND.ITTFLG.EQ.0) GO TO 49                    RET
      IF(ISAV(1).EQ.4HEND ) GO TO 40                                    RET
      IF(ISAV(1).EQ.4HEOF ) GO TO 99                                    RET
C                                                                       RET
C BUILD RETREIVAL CRITERIA ARRAYS                                       RET
C                                                                       RET
    5 JSTALL=0                                                          RET
      IS = 0                                                            RET
      ISFLG = 0                                                         RET
```

```
   45 CALL SETCRI(LSTUDY,IS,JSTALL)                                      RET
C     OUTPUT,(LSTUDY(I),I=1,5),IS,JSTALL                                 RET
      GO TO 1                                                            RET
    6 JDTALL=0                                                           RET
      ID = 0                                                             RET
      IDFLG = 0                                                          RET
   46 CALL SETCRI(LDATE,ID,JDTALL)                                       RET
C     OUTPUT,(LDATE(I),I=1,10),ID,JDTALL                                 RET
      GO TO 1                                                            RET
    7 MANALL=0                                                           RET
      IM = 0                                                             RET
      IMFLG = 0                                                          RET
   47 CALL SETCRI(LMAN,IM,MANALL)                                        RET
C     OUTPUT,(LMAN(I),I=1,9),IM,MANALL                                   RET
      GO TO 1                                                            RET
    8 JTPALL=0                                                           RET
      ITP = 0                                                            RET
      ITPFLG = 0                                                         RET
   48 CALL SETCRI(LTYPE,ITP,JTPALL)                                      RET
C     OUTPUT,(LTYPE(I),I=1,10),ITP,JTPALL                                RET
      GO TO 1                                                            RET
    9 JTTALL=0                                                           RET
      ITT = 0                                                            RET
      ITTFLG = 0                                                         RET
   49 CALL SETCRI(LTEST,ITT,JTTALL)                                      RET
      ITT=1                                                              RET
C     IF(JTTALL.EQ.1) ITT = 124                                          RET
      LSTART = ISAV(3)                                                   RET
      LSTOP  = ISAV(4)                                                   RET
      IF(LSTOP.EQ.0) LSTOP=LSTART                                        DEC1
      GO TO 1                                                            RET
   19 DO 119 I=1,16                                                      RET
  119 JOB(I)=ISAV(I)                                                     RET
      IF(IOPLOT.EQ.0.AND.JOB(3).GE.1000) CALL PLOTS(14HNASA ENDOCRINE,   RET
     1  14)                                                              RET
      IF(JOB(3).GE.1000) IOPLOT = 999                                    RET
      IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH.OR.JOB(2).EQ.4HVOLU)GOTO1  DEC10
      JOB(2)=4HDATE                                                      DEC10
      PRINT 601                                                          DEC10
  601 FORMAT(* UNKNOWN JOB PARAMETER DATE ASSUMED*)                      DEC10
      GO TO 1                                                            RET
C                                                                        RET
C BUILD HIT ARRAY OF SAMPLE NUMBERS                                      RET
C                                                                        RET
   40 CONTINUE                                                           RET
      LT = LSTART - 1                                                    RET
C                                                                        RET
C     DO 4321 LT=LSTART,LSTOP                                            RET
  140 IF(IFFF - 2) 145,240,145                                           RET
  145 LT = LT + 1                                                        RET
C                                                                        RET
      IF(LT - LSTOP) 150,150,4321                                        RET
  150 LM = 0                                                             RET
      IFFF = 2                                                           RET
C     IF(KOT.EQ.0) CALL SSWTCH(1,KKT)                                    RET
C     IF(KKT.EQ.1) GO TO 999                                             RET
      LTEST(1) = LT                                                      RET
C     DO 4321 LM=1,3                                                     RET
  240 LM = LM + 1                                                        RET
      IF(LM - 3) 250,250,245                                             RET
  245 IFFF = 1                                                          RET
      GO TO 140                                                         RET
  250 LMAN(1) = LM                                                      RET
      IH = 1                                                            RET
C     REWIND 1                                                          RET
      CALL REWND(FITRA1)                                                RET
C                                                                       RET
C                                                                       RET
C THE KEYED (RA1) SAMPLE DIRECTORY FILE IS TREATED AS A SEQUENTIAL     RET
C     FILE DURING THE SEARCH FOR SAMPLES WHICH SATISFY                  RET
C                    THE INPUT CRITERIA                                 RET
C                                                                       RET
C  10 BUFFER IN(1,1)(IBUF(1),IBUF(14))                                  RET
   10 CALL GETN(FITRA1)                                                 RET
      IF(IFETCH(FITRA1,2LFP).EQ.100B) GO TO 23                          RET
    2 IF(JSTALL.EQ.1) GO TO 12                                          RET
      DO 11 I=1,IS                                                      RET
      IF(IBUF(2).EQ.LSTUDY(I)) GO TO 12                                 RET
   11 CONTINUE                                                          RET
      GO TO 10                                                          RET
   12 IF(JDTALL.EQ.1.AND.JOB(2).EQ.4HVOLU) GO TO 44                     RET
C                                                                       RET
C CHECK FOR SIMULTANEOUS @ALL@ AND DATE @SAVE@ OPTION                   RET
C                                                                       RET
      IF(JDTALL.EQ.1.AND.(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH))GO TO 41RET
      DO 13 I=1,ID                                                      RET
      IF(IBUF(3).EQ.LDATE(I)) GO TO 14                                  RET
   13 CONTINUE                                                          RET
      GO TO 10                                                          RET
   41 MDSAV = IBUF(3)                                                   RET
      GO TO 44                                                          RET
C                                                                       RET
C CHECK FOR DATE SAVE OPTION                                            RET
C                                                                       RET
   14 IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH) MDSAV=LDATE(I)           RET
   44  IF(MANALL.EQ.1) GO TO 16                                         RET
      DO 15 I=1,IM                                                      RET
      IF(IBUF(4).EQ.LMAN(I)) GO TO 16                                   RET
   15 CONTINUE                                                          RET
      GO TO 10                                                          RET
   16 IF(JTPALL.EQ.1) GO TO 18                                          RET
      DO 17 I=1,ITP                                                     RET
      IF(IBUF(5).EQ.LTYPE(I)) GO TO 18                                  RET
   17 CONTINUE                                                          RET
      GO TO 10                                                          RET
C                                                                       RET
C CHECK FOR MASTER SAMPLE NUMBER                                        RET
C                                                                       RET
   18 IF(IBUF(14).EQ.0) GO TO 21                                        RET
      MIH = IH-1                                                        RET
      DO 20 I=1,MIH                                                     RET
      IF(LHIT(I).EQ.IBUF(14)) GO TO 10                                  RET
   20 CONTINUE                                                          RET
      LHIT(IH)=IBUF(14)                                                 RET
C     PRINT 220,(LHIT(I),I=1,10)                                        RET
C 220 FORMAT(5X,5HLHIT2,5X,10I10)                                       RET
      GO TO 22                                                          RET
   21 LHIT(IH)=IBUF(1)                                                  RET
C     PRINT 221,(LHIT(I),I=1,10)                                        RET
C 221 FORMAT(5X,5HLHIT1,5X,10I10)                                       RET
```

```
C                                                                       RET
C IF DATE SAVE OPTION WAS SPFCIFIED FILL DATE ARRAY CORRESPONDING       RET
C    TO SAMPLE NUMBER HIT ARRAY                                         RET
C                                                                       RET
   22 IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH) MDATE(IH)=MDSAV          RET
C                                                                       RET
C IF TOTAL VOLUME SAVE OPTION WAS SPECIFIED FILL VOLUME ARRAY           RET
C         CORRESPONDING TO SAMPLE NUMBER HIT ARRAY                      RET
C                                                                       RET
      IF(JOF(2).EQ.4HVOLU.OR.JOB(2).EQ.4HBOTH)MTVOL(IH)=IBUF(10)        RET
       IH=IH+1                                                          RET
      IF(IH.LE.151)  GO TO 10                                           XREDUC
   23 NSMP = IH - 1                                                     RET
      IF(NSMP.LE.150)  GO TO 35                                         XREDUC
      PRINT 30                                                          RET
   30 FORMAT(1H1,17HHIT FILE OVERFLOW    )                              RET
      STOP 30                                                           RET
C                                                                       RET
   35 CALL RETRVE                                                       RET
      PRINT 300, LSTUDY,LMAN,JOB,LTYPE,NSMP,NDATA                       RET
  300 FORMAT(1H0,6HLSTUDY,10I10,//,2X,4HLMAN,9I10,//,                   DEC10
     .   1X, 4HJOB ,A4,5X,A4,5X,14I6,//,6H LTYPE,20I5,//,               RET
     .   1X, 7HNSMP = ,I5,10X,8HNDATA = ,I5)                            DEC10
      PRINT 301,(LDATE(I),I=1,ID)                                       RET
  301 FORMAT(6H LDATE /,(10I10))                                        RET
      PRINT 302,(LTEST(I),I=1,ITT)                                      RET
  302 FORMAT(6H LTEST  ,(10I10))                                        RET
      PRINT 306,(MTVOL(I),I=1,NSMP)                                     RET
  306 FORMAT(1H0,5HMTVOL,/,(10I10))                                     DEC10
      PRINT 303,(MDATE(I),I=1,NSMP)                                     RET
  303 FORMAT(1H0,5HMDATE,/,(10I10))                                     DEC10
      PRINT 304,(LHIT(I),I=1,NSMP)                                      RET
  304 FORMAT(/ ,6H LHIT ,/,(10I10))                                     DEC10
      PRINT 305,(XDATA(I),I=1,NDATA)                                    RET
  305 FORMAT(1H0,5HXDATA,/,(8F15.6))                                    DEC10
C     PRINT 300, LSTUDY,LMAN,JOB,LTYPE,NSMP,NDATA                       RET
C 300 FORMAT(1H1,6HLSTUDY,10I10,//,2X,4HLMAN,9I10,//,                   RET
C    .         4HJOB ,A4,5X,A4,5X,14I6,//,5HLTYPE,20I5,//,              RET
C    .         7HNSMP = ,I5,10X,8HNDATA = ,I5,// )                      RET
C     PRINT 301,(LDATE(I),I=1,ID)                                       RET
C 301 FORMAT(5HLDATE /,(10I10))                                         RET
C     PRINT 302,(LTEST(I),I=1,ITT)                                      RET
C 302 FORMAT(5HLTEST  ,(10I10))                                         RET
C     PRINT 306,(MTVOL(I),I=1,NSMP)                                     RET
C 306 FORMAT(1H1,5HMTVOL,/,(10I10))                                     RET
C     PRINT 303,(MDATE(I),I=1,NSMP)                                     RET
C 303 FORMAT(1H1,5HMDATE,/,(10I10))                                     RET
C     PRINT 304,(LHIT(I),I=1,NSMP)                                      RET
C 304 FORMAT(//,5HLHIT ,/,(10I10))                                      RET
C     PRINT 305,(XDATA(I),I=1,NDATA)                                    RET
C 305 FORMAT(1H1,5HXDATA,/,(8F15.6))                                    RET
C                                                                       RET
C                                                                       RET
C     ------------------------------------------------------------------RET
      RETURN                                                            RET
C     CALL STAT                                                         RET
 4321 CONTINUE                                                          RET
      IFFF = 0                                                          RET
C                                                                       RET
C     ------------------------------------------------------------------RET
```

```
C                                                                       RET
C     REWIND 1                                                          RET
      CALL REWND(FITRA1)                                                RET
      GO TO 201                                                         RET
C                                                                       RET
  888 PRINT 8800                                                        RET
 8800 FORMAT(15H FILE 1 REWOUND)                                        RET
      RETURN                                                            RET
   99 CONTINUE                                                          RET
      CALL CLOSEM(FITRA1)                                               RET
      CALL CLOSEM(FITRA2)                                               RET
      CALL CLOSEM(FITRA3)                                               RET
      CALL CLOSEM(FITRA4)                                               RET
      IF(IOPLOT) 199,199,999                                            RET
  999 CALL STOPPLT                                                      RET
      PRINT 900                                                         RET
  900 FORMAT(19H0NORMAL END OF JOB.)                                    RET
      STOP 2000                                                         RET
  199 STOP 1                                                            RET
      END                                                               RET
      SUBROUTINE SETCRI(LBUF,JNDX,LALL)                                 SETCRI
C  THIS SUBROUTINE STORES INFORMATION FROM ONE DATA CARD INTO THE       SETCRI
C                         CORRESPONDING CRITERIA ARRAY                  SETCRI
C                                                                       SETCRI
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          SETCRI
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)           XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   SETCRI
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           SETCRI
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      SETCRI
     +                MFUNC,IFILE,IERR                                  SETCRI
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           SETCRI
      DIMENSION LBUF(1)                                                 SETCRI
      IF(ISAV(2).EQ.4HALL .OR.ISAV(2).EQ.4H    ) GO TO 1                SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=ISAV(3)                                                SETCRI
      IF(ISAV(2).EQ.4HEACH) GO TO 3                                     SETCRI
      INXT=ISAV(3)+1                                                    SETCRI
    2 IF(INXT.GT.ISAV(4)) RETURN                                        SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=INXT                                                   SETCRI
      INXT=INXT+1                                                       SETCRI
      GO TO 2                                                           SETCRI
    3 DO 5 I=4,16                                                       SETCRI
      IF(ISAV(I).EQ.0) RETURN                                           SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=ISAV(I)                                                SETCRI
    5 CONTINUE                                                          SETCRI
      RETURN                                                            SETCRI
    1 LALL=1                                                            SETCRI
      RETURN                                                            SETCRI
      END                                                               SETCRI
      SUBROUTINE RETRVE                                                 RETRVE
C                                                                       RETRVE
C THIS SUBROUTINE RETREVES THOSE DATA VALUES FROM THE BLOOD OR          RETRVE
C       URINE FILES WHICH SATISFY THE INPUT CRITERIA                    RETRVE
C       THE DATA VALUES ARE STORED IN ARRAY XDATA                       RETRVE
C                                                                       RETRVE
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XREDUC
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RETRVE
      COMMON/INDEX/INDX(136),INDX3(136)                                 DEC10
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)                 XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),         RETRVE
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA                 RETRVE
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEE,KYE,            RETRVE
     +                MFUNC,IFILE,IERR                                        RETRVE
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)                 RETRVE
      DIMENSION XTEMP(125)                                                    RETRVE
      INTEGER KEY(2)                                                          RETRVE
      EQUIVALENCE(T,XTEMP)                                                    RETRVE
      EQUIVALENCE (KEE,KEY(2))                                                RETRVE
      DATA(INDX(I),I=1,136)/400,401,402,403,404,405,503,406,407,408,409,DEC10
     .   410,                                                               DEC10
     1   411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,DEC10
     2   427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,DEC10
     3   443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,DEC10
     4   459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,DEC10
     5   475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,DEC10
     6   491,492,493,494,495,496,497,498,499,500,501,502,300,301,302,303,DEC10
     7   304,305,306,307,321,308,309,310,311,312,313,314,315,316,317,318,DEC10
     .   319,                                                               DEC10
     8   320,514,515,516,517,518,519,520,521,522,523/                       DEC10
      DATA (INDX3(I),I=1,136)/2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,      DEC10
     1   18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,    DEC10
     2   39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,    DEC10
     3   60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,    DEC10
     4   81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,      DEC10
     5101,102,103,104,105,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,DEC10
     6   20,21,22,23,116,117,118,119,120,121,122,123,124,125/               DEC10
      DATA ICDT/445B/                                                       RETRVE
      M=1                                                                   RETRVE
      KSAV=0                                                                RETRVE
      IERR=0                                                                RETRVE
      DO 27 K=1,NSMP                                                        RETRVE
      DO 27 I=1,ITT                                                         RETRVE
C                                                                           RETRVE
C   IDENTIFY TEST NUMBER IN INDEX                                           RETRVE
C                                                                           RETRVE
      DO 24 J=1,136                                                         DEC10
      IF(LTEST(I).EQ.INDX(J)) GO TO 25                                      DEC10
   24 CONTINUE                                                              DEC10
      STOP @INVALID TEST NUMBER@                                            DEC10
   25 IJ=J                                                                  DEC10
      LREC=INDX3(IJ)                                                        DEC10
      IF(LTEST(I) -400) 41,31,31                                            RETRVE
   31 INDX1 = 1RU                                                           RETRVE
      GO TO 50                                                              RETRVE
   41 INDX1 = 1RB                                                           RETRVE
C                                                                           RETRVE
C   PICK UP KEY FROM HIT ARRAY OF SAMPLE NUMBERS                            RETRVE
C                                                                           RETRVE
   50 KEY(2)=LHIT(K)                                                        RETRVE
C                                                                           RETRVE
C DETERMINE IF DATA NEEDED IS FROM CURRENT RECORD                           RETRVE
C                                                                           RETRVE
      IF(KEY(2).EQ.KSAV) GO TO 26                                           RETRVE
C                                                                           RETRVE
C   CHECK FOR URINE OR BLOOD FILE                                           RETRVE
C                                                                           RETRVE
C  29 IF(INDX1(IJ).EQ.1RU) GO TO 28                                         RETRVE
   29 IF(INDX1.EQ.1RU) GO TO 28                                             RETRVE
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C     CALL RANDOM(1,@RA3@,XTEMP,32,KEY,100 ,100 ,ICODE,LOC)              RETRVE
      CALL GET(FITRA3)                                                   RETRVE
      LOC = 3                                                            RETRVE
      IFILE = 3                                                          RETRVE
      IF(IERR.NE.0) GO TO 100                                            RETRVE
      GO TO 26                                                           RETRVE
C  28 CALL RANDOM(1,@RA2@,XTEMP,125,KEY,100 ,100 ,ICODE,LOC)             RETRVE
   28 CALL GET(FITRA2)                                                   RETRVE
      LOC = 2                                                            RETRVE
      IFILE = 2                                                          RETRVE
      IF(IERR.NE.0) GO TO 100                                            RETRVE
C                                                                        RETRVE
C                                                                        RETRVE
C FETCH WORD NUMBER OF DATA RECORD FROM INDEX, STORE DATA                RETRVE
C    VALUE IN CURRENT XDATA LOCATION AND INCREMENT                       RETRVE
C           XDATA LOCATION COUNTER M                                     RETRVE
C                                                                        RETRVE
C                                                                        RETRVE
C  26 LREC=INDX3(IJ)                                                     RETRVE
   26 XDATA(M)=XTEMP(LREC)                                               RETRVE
   30 M=M+1                                                              RETRVE
      IF(M.GT.150)  GO TO 110                                            XREDUC
      KSAV=KEY(2)                                                        RETRVE
   27 CONTINUE                                                           RETRVE
C                                                                        RETRVE
C                                                                        RETRVE
C NDATA = NUMBER OF DATA VALUES RETREIVED                                RETRVE
C                                                                        RETRVE
C                                                                        RETRVE
      NDATA=M-1                                                          RETRVE
      RETURN                                                             RETRVE
  100 IF(IERR .EQ.ICDT) GO TO 105                                        RETRVE
      PRINT 101,IERR ,KEY(2)                                             RETRVE
  101 FORMAT(1H ,19HRANDOM ERROR-RETRVE,O8,5X,I4)                        RETRVE
      STOP 100                                                           RETRVE
  105 PRINT 104,KEY(2)                                                   RETRVE
  104 FORMAT(1H ,27HSAMPLE NO. NOT FOUND-RETRVE,5X,I4)                   RETRVE
      XDATA(M)=-1.                                                       RETRVE
      IERR=0                                                             RETRVE
      GO TO 30                                                           RETRVE
  110 PRINT 111                                                          RETRVE
  111 FORMAT(1H1,43HDATA BUFFER FULL BEFORE ALL DATA RETREIVED    )      RETRVE
      STOP 110                                                           RETRVE
      END                                                                RETRVE
      SUBROUTINE STAT                                                    STAT
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP         XREDUC
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)            XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),    STAT
     .                 LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           STAT
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3),SSE(3)STAT
      COMMON Y(3,3,80),N(3,3),A(4,4),B(4,4),AP(3),Q(3),W(3),V(3),WW(3),  ANOV1
     1VV(3),NSUMI(3),SUMYI(3),NSUMJ(3),SUMYJ(3),SUMYIJ(3,3),TAUHAT(3),   ANOV1
     2    BETHAT(3),THAT(3),BHAT(3)                                      ANOV1
      COMMON/AOV2NE/IDEN(8),NAMET,NAMEB,IWT,SUMSQX,TAU,MNSQT,FRATIO,     ANOV1
     1 IERR,ERROR,MNSQE,SST,MNSST,FSST,INT,TIN,TINT,FINT,ITHT,WITHT,     ANOV1
     2 WIT,NSUM,SUMSQY,SUMSQT,BETA,MNSQB,FRATB,ERRORB,MNSQBE,SSB,MNSSB,  ANOV1
     3 FSSB,BIN,BINT,FINB,PFRAT,PFSST,PFINT,PFRATB,PFSSB,PFINB           ANOV1
      REAL KSTUDY, KTYPE, KMAN, KTEST, NITS                              STAT
      REAL MNSSB,MNSST,MNSQB,MNSQBE,MNSQT,MNSQE                          ANOV1
      DIMENSION DEN(8)                                                   ANOV1
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      DIMENSION KOE(3)                                                  ANOV1
      EXTERNAL TWOWT,TWOAVT,TWOAVB                                      ANOV1
      DIMENSION ISIG(2)                                                 STAT
      DIMENSION X(1)                                                    STAT
      DIMENSION LTEXT(120), MTEXT(120), XOUT(120)                       STAT
      DIMENSION NDF(3), S(3), P(3), TM(3), WTV(3), XMS(3), IPP(3),IP2(3)STAT
      DIMENSION ID1(120), ID2(120), LK(3)                               STAT
      EQUIVALENCE (IDEN,DEN)                                            ANOV1
      EQUIVALENCE(X,XDATA)                                              STAT
      DATA ID1/120*1/, LK/3*0/                                          STAT
      DATA IPP/4HPRE , 4HIN   , 4HPOST/                                 STAT
      DATA IP2/8HPRE-IN  , 8HIN-POST , 8HPRE-POST/                      STAT
C                                                                       STAT
C     FILL OUTPUT ARRAY                                                 STAT
C                                                                       STAT
      DATA ISTAR/1H*/, IBLANK/1H /, ISAVE/4HSAVE/                       STAT
      DATA IPLUS/1H+/, IMINUS/1H-/, IPPL/2H++/, IMMI/2H--/              STAT
      DATA IDATE/4HDATE/, IVOLU/4HVOLU/, IBOTH/4HBOTH/                  STAT
      NOBS = NDATA                                                      STAT
    1 IF(NOBS - 1) 999,999,2                                            STAT
    2 LOOP = ITT                                                        STAT
      IDATEF = 0                                                        STAT
      IVOLUF = 0                                                        STAT
      IF(JOB(2).EQ.IDATE) IDATEF = 3                                    STAT
      IF(JOB(2).EQ.IVOLU) IVOLUF = 3                                    STAT
      IF(JOB(2).NE.IBOTH) GO TO 3                                       STAT
      IDATEF = 3                                                        STAT
      IVOLUF = 3                                                        STAT
    3 KKK = NOBS/LOOP                                                   STAT
      CALL TEXT(LSTUDY(1), LTYPE(1), LMAN(1), LTEST(1),                 STAT
     X KSTUDY, KTYPE, KMAN, KTEST, NITS)                                STAT
      CALL DATE(IWORD)                                                  STAT
      PRINT 1000, JOB(3)                                                STAT
 1000 FORMAT(1H1,20X,42HNASA MSC ENDOCRINE DATA RETREIVAL PROGRAM.,I7/) STAT
      PRINT 500, LSTUDY(1), KSTUDY,IWORD                                STAT
  500 FORMAT(7H0STUDY.,I2,2X, A8,20X,A10)                               STAT
      PRINT 600, LTEST(1), KTEST,LMAN(1), KMAN                          STAT
  600 FORMAT(6H0TEST.,I3,2X A8 ,20X,4HMAN.,I4,2X, A8)                   STAT
      PRINT 700,(LTYPE(I),I=1,ITP)                                      DEC10
  700 FORMAT(6H0TYPE.,20I3)                                             DEC10
      PRINT 800, NITS                                                   STAT
  800 FORMAT(15H0JULIAN DATE   , A8)                                    STAT
C     DO 150 L=1,LOOP                                                   STAT
      L = 1                                                             STAT
      LOOP = 1                                                          STAT
      DO 210 II=LOOP,NOBS,LOOP                                          STAT
      I = II + L - LOOP                                                 STAT
      IPLACE = II/LOOP                                                  STAT
  210 XOUT(IPLACE) = XDATA(I)                                           STAT
C                                                                       STAT
C     SORT BY DATE                                                      STAT
C                                                                       STAT
      NOSLTS = NOBS/LOOP                                                STAT
      NM1 = NOSLTS - 1                                                  STAT
      DO 230 I=1,NM1                                                    STAT
      IMAX = 9999                                                       STAT
      ISUB = I                                                          STAT
      DO 220 J=I,NOSLTS                                                 STAT
      IF(IMAX-MDATE(J)) 220,220,211                                     STAT
  211 IMAX = MDATE(J)                                                   STAT
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      ISUB = J                                                          STAT
  220 CONTINUE                                                          STAT
      ITEMP = MDATE(ISUB)                                               STAT
      TEMP = XOUT(ISUB)                                                 STAT
      MDATE(ISUB) = MDATE(I)                                            STAT
      XOUT(ISUB) = XOUT(I)                                              STAT
      MDATE(I) = ITEMP                                                  STAT
      XOUT(I) = TEMP                                                    STAT
  230 CONTINUE                                                          STAT
      IG = LSTUDY(1)                                                    STAT
      IVV(1)=IVV(2)=IVV(3)=0                                            APR24
      IVV(4) = NOSLTS                                                   STAT
      DO 240 I=1,NOSLTS                                                 STAT
      IF(MDATE(I).LE.DATESC(2,IG)) IVV(2) = I                           STAT
      IF(MDATE(I).LE.DATESC(3,IG)) IVV(3) = I                           STAT
  240 XDATA(I) = XOUT(I)                                                STAT
      DO 133 I=1,3                                                      STAT
      NFIRST = IVV(I) + 1                                               STAT
      NLAST = IVV(I + 1)                                                STAT
      CALL MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                     STAT
      SSMEAN(I) = SMEAN                                                 STAT
      SSIGMA(I) = SIGMA                                                 STAT
      NNN(I) = NN                                                       STAT
  133 CONTINUE                                                          STAT
      NFIRST = 1                                                        STAT
      NLAST = NOSLTS                                                    STAT
      CALL MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                     STAT
C                                                                       STAT
C     IF THERE ARE 2 OR MORE PRE-FLIGHT OBSERVATIONS THE EXTREME VALUES STAT
C     ARE FLAGED ON THE BASIS OF PRE-FLIGHT MEAN AND STD. DEV.          STAT
C     OTHERWISE THE TOTAL MEAN AND STD. DEV. ARE USED.                  STAT
C                                                                       STAT
      IF(NNN(1) - 2) 134,136,136                                        STAT
  134 SSG = SIGMA                                                       STAT
      SSM = SMEAN                                                       STAT
      GO TO 137                                                         STAT
  136 SSG = SSIGMA(1)                                                   STAT
      SSM = SSMEAN(1)                                                   STAT
  137 T01 = 2.3263*SSG                                                  STAT
      T05 = 1.6449*SSG                                                  STAT
      DO 166 II=1,3                                                     STAT
      IFIRST = IVV(II)+ 1                                               STAT
      ILAST = IVV(II + 1)                                               STAT
      IF(IFIRST-ILAST)162,163,166                                       APR24
  163 PRINT 401                                                         APR24
  401 FORMAT(*  SINGLE VALUE NOT ANALYZED*)                             APR24
  162 DO 165 I=IFIRST,ILAST                                             STAT
      MTEXT(I) = IBLANK                                                 STAT
      IF(X(I)) 164,165,153                                              STAT
  153 DELTA = X(I) - SSM                                                STAT
      IF(DELTA) 155,154,157                                             STAT
  154 IF(X(I).NE.2.0) GO TO 164                                         STAT
      DELTA = SSM                                                       STAT
      GO TO 156                                                         STAT
  155 DELTA = -DELTA                                                    STAT
  156 IF(DELTA.GE.T05) MTEXT(I) = IMINUS                                STAT
      IF(DELTA.GE.T01) MTEXT(I) = IMMI                                  STAT
      GO TO 164                                                         STAT
  157 IF(DELTA.GE.T05) MTEXT(I) = IPLUS                                 STAT
      IF(DELTA.GE.T01) MTEXT(I) = IPPL                                  STAT
  164 PRINT 400,MDATE(I), X(I), LTEXT(I), MTEXT(I)                        STAT
  165 CONTINUE                                                            STAT
      PRINT 900,SSMEAN(II), SSIGMA(II), NNN(II)                           STAT
  166 CONTINUE                                                            STAT
      IF(JOB(3) - 1000) 150,145,145                                       STAT
  145 IF(NN) 150,150,146                                                  STAT
  146 CALL STPLOT(LOOP,NOBS,NSLOT,IWORD,KSTUDY,KTYPE,KMAN,KTEST,SMEAN,     STAT
     X SIGMA)                                                             STAT
  150 CONTINUE                                                            STAT
C                                                                         STAT
C     ICASE = 0     NO TESTS                                              STAT
C     ICASE = 1     PREFLIGHT ONLY                                        STAT
C     ICASE = 2     PRE AND INFLIGHT ONLY                                 STAT
C     ICASE = 3     ALL                                                   STAT
C     ICASE = 4     PRE AND POSTFLIGHT ONLY                               STAT
C                                                                         STAT
      IF(NNN(1)-1) 170,170,171                                            DEC1
  170 NT = 0                                                              STAT
      ICASE = 0                                                           STAT
      GO TO 999                                                           DEC1
  171 SSE(1) = SSIGMA(1)/SQRT(FLOAT(NNN(1)))                              STAT
      PRINT 3000,NNN(1), SSMEAN(1), SSIGMA(1), SSE(1)                     STAT
 3000 FORMAT(20(4H----)/23H PARAMETRIC STATISTICS.//8H0SUMMARY/           STAT
     X39H0SAMPLE  N    MEAN        SD          SE/4H0PRE, I6, 3F11.3)     STAT
      IF(NNN(2)-1) 172,172,176                                            DEC1
  172 IF(NNN(3)-1) 173,173,174                                            DEC1
  173 NT = 1                                                              STAT
      ICASE = 1                                                           STAT
      GO TO 999                                                           DEC1
  174 SSE(3) = SSIGMA(3)/SQRT(FLOAT(NNN(3)))                              STAT
      PRINT3010,NNN(3), SSMEAN(3), SSIGMA(3), SSE(3)                      STAT
      NT = 2                                                              STAT
      ICASE = 4                                                           STAT
      NN=NN-NNN(2)                                                        FIX2
C                                                                         STAT
      GO TO 180                                                           DEC1
C     CHANGE THIS LATER                                                   STAT
C                                                                         STAT
  176 SSE(2) = SSIGMA(2)/SQRT(FLOAT(NNN(2)))                              STAT
      PRINT3020,NNN(2), SSMEAN(2), SSIGMA(2), SSE(2)                      STAT
 3020 FORMAT(4H0IN ,I6,3F11.3)                                            STAT
      IF(NNN(3)-1) 177,177,178                                            DEC1
  177 NT = 2                                                              STAT
      ICASE = 2                                                           STAT
      NN=NN-NNN(3)                                                        FIX2
      GO TO 180                                                           STAT
  178 SSE(3) = SSIGMA(3)/SQRT(FLOAT(NNN(3)))                              STAT
      PRINT3010,NNN(3), SSMFAN(3), SSIGMA(3), SSE(3)                      STAT
 3010 FORMAT(5H0POST,I5,3F11.3)                                           STAT
      NT = 3                                                              STAT
      ICASE = 3                                                           STAT
  180 CONTINUE                                                            STAT
      SE = SIGMA/SQRT(FLOAT(NN))                                          STAT
      PRINT 3030, NN, SMEAN, SIGMA, SE                                    STAT
 3030 FORMAT(4H ---,10(4H----)/4H SUM,I6,3F11.3)                          STAT
C                                                                         STAT
C     GET RID OF NEGATIVE VALUES                                          STAT
C         I  RANGES OVER ALL POINTS.                                      STAT
C         J  RANGES OVER VALID POINTS.                                    STAT
C                                                                         STAT
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      J = 1                                                             STAT
      DO 330 I=1,NOSLTS                                                 STAT
      IF(X(I)) 310,330,320                                              STAT
  310 IF(X(I) + 2.0) 330,315,330                                        STAT
  315 X(J) = 0.0                                                        STAT
      J = J + 1                                                         STAT
      GO TO 330                                                         STAT
  320 X(J) = X(I)                                                       STAT
      J = J + 1                                                         STAT
  330 CONTINUE                                                          STAT
      IF(ICASE.EQ.4) 710,711                                            FIX
  710 IF(NNN(2).EQ.1) GO TO 712                                         FIX
      GO TO 713                                                         FIX
  712 NNN1=NNN(1)+1                                                     FIX
      NSLTM1=J-1                                                        FIX
      DO 179 I=NNN1,NSLTM1                                              FIX
  179 X(I)=X(I+1)                                                       FIX
  713 NNN(2)=NNN(3)                                                     FIX
      NNN(3)=0                                                          FIX
  711 CONTINUE                                                          FIX
      ITOT=JTOT=3                                                       ANOV1
      IF(ICASE.EQ.2.OR.ICASE.EQ.4) ITOT=2                               ANOV1
      IB=LMAN(1)                                                        ANOV1
      K1=0                                                              ANOV1
      DO 699 IT=1,ITOT                                                  ANOV1
      K=N(IT,IB)=NNN(IT)                                                ANOV1
      DO 702 I=1,K                                                      ANOV1
  702 Y(IT,IB,I)=X(I+K1)                                                ANOV1
      K1=K+K1                                                           ANOV1
  699 CONTINUE                                                          ANOV1
      CALL ACRDAN(X, NT, NNN, TM, WTV, S, GM, NDF, IER)                 STAT
      N1 = NDF(1)                                                       STAT
      N2 = NDF(2)                                                       STAT
      S1 = S(1)                                                         STAT
      S2 = S(2)                                                         STAT
      CALL FFOUT(S1,S2,N1,N2,FVAL,PRFVAL)                               STAT
      DO 193 IMS=1,3                                                    STAT
  193 XMS(IMS) = S(IMS)/NDF(IMS)                                        STAT
      PRINT 3090                                                        STAT
 3090 FORMAT(1X)                                                        STAT
      PRINT 3100                                                        STAT
 3100 FORMAT(28H0ANALYSIS OF VARIANCE TABLE./35H0        DF      SS     STAT
     X  MS      F /35H        ----      ----        ----     ---)       STAT
      PRINT 3200, NDF(1), S(1), XMS(1), FVAL                            STAT
 3200 FORMAT(6H TREAT, I4, F10.1, F10.1, F8.3)                          STAT
      PRINT 3300, NDF(2), S(2), XMS(2)                                  STAT
 3300 FORMAT(6H0ERROR, I4, F10.1, F10.1, 6H  --- /4H ---, 9(4H----))    STAT
      PRINT 3400, NDF(3), S(3), XMS(3)                                  STAT
 3400 FORMAT(6H TOTAL, I4, F10.1, F10.1, 6H  --- )                      STAT
      PRINT 3800, FVAL, PRFVAL                                          STAT
 3800 FORMAT(1H0,F7.3, 23H IS SIGNIFICANT AT THE  ,F5.1, 14H PERCENT LEVSTAT
     1EL)                                                               STAT
      IF(NT-2) 999,850,824                                              DEC10
  824 IF(PRFVAL - 5.0) 825,825,850                                      STAT
  825 N1 = 1                                                            STAT
      PRINT 3500                                                        STAT
 3500 FORMAT(14H0CONTRAST    F )                                        STAT
      P(1) = 1                                                          STAT
      P(2) = -1                                                         STAT
      P(3)=0                                                            FIX
      CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                          STAT
      CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                               STAT
      PRINT 3600,IP2(1),FVAL,PRFVAL                                     FIX
 3600 FORMAT(1H0,A8,F8.3,23H IS SIGNIFICANT AT THE    ,F5.1,            FIX
     X15H PERCENT LEVEL.)                                               STAT
      P(1) = 0                                                          STAT
      P(2) = 1                                                          STAT
      P(3) = -1                                                         STAT
      CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                          STAT
      CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                               STAT
      PRINT 3600,IP2(2),FVAL,PRFVAL                                     FIX
      P(1) = 1                                                          STAT
      P(2) = 0                                                          STAT
      CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                          STAT
      CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                               STAT
      PRINT 3600,IP2(3),FVAL,PRFVAL                                     FIX
  850 CONTINUE                                                          STAT
  851 NP = 0                                                            STAT
      DO 855 I=1,NT                                                     STAT
      NCDC = NNN(I)                                                     STAT
      DO 855 J=1,NCDC                                                   STAT
      NP = NP + 1                                                       STAT
  855 ID2(NP) = I                                                       STAT
      IF(ICASE.EQ.4) GO TO 860                                          DEC1
      PRINT 4000                                                        STAT
 4000 FORMAT(1H0/20(4H----)/27H NON-PARAMETRIC STATISTICS.)             STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0,NT,NNN,LK)                         STAT
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,NT,NNN,LK,LK)                       FIX2
      PRINT 1100,IP2(1)                                                 STAT
 1100 FORMAT(1H0/10H0CONTRAST , A8)                                     STAT
      NP = NNN(1) + NNN(2)                                              STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0, 2,NNN,LK)                         STAT
      IPI=2                                                             FIX2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)                       FIX2
      IF(ICASE.EQ.2) GO TO 998                                          FIX
      NP = NNN(2) + NNN(3)                                              STAT
      IST = NNN(1) + 1                                                  STAT
      PRINT 1100,IP2(2)                                                 STAT
C     CALL  KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,0,2,NNN(2),LK)        STAT
      IPI=3                                                             FIX2
      CALL KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,1,2,NNN(2),LK,IPI)     FIX2
      NCDC = NNN(3)                                                     STAT
      DO 880 J=1,NCDC                                                   STAT
      K = NNN(1) + J                                                    STAT
      L=NNN(1)+NNN(2)+J                                                 FIX
      X(K) = X(L)                                                       STAT
      ID1(K) = ID1(L)                                                   STAT
  880 ID2(K) = ID2(L)                                                   STAT
      NP=NNN(1)+NNN(3)                                                  FIX
      NNN(2)=NNN(3)                                                     FIX
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0, 2,NNN,LK)                         STAT
  860 PRINT 1100,IP2(3)                                                 DEC1
      IPI=3                                                             FIX2
      IF(ICASE.EQ.4) IPI=2                                              FIX2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)                       FIX2
  998 CONTINUE                                                          FIX
      IF(IB.EQ.3) 701,999                                               ANOV
  701 MAXT=MAXB=3                                                       ANOV
      MAXT1=MAXT+1                                                      ANOV
      MAXB1=MAXB+1                                                      ANOV
      NAMET=4HTIME                                                        ANOV1
      NAMEB=5HASTRO                                                       ANOV1
      IWT=1                                                               ANOV1
      DEN(1)=KSTUDY                                                       ANOV1
      DEN(2)=KTEST                                                        ANOV1
      IDEN(8)=3HALL                                                       ANOV1
      IF(ICASE.EQ.2) IDEN(8)=IP2(1)                                       ANOV1
      IF(ICASE.EQ.4) IDEN(8)=IP2(3)                                       ANOV1
      DO 703 J=1,JTOT                                                     ANOV1
      DO 704 I=1,ITOT                                                     ANOV1
      KK=N(I,J)                                                           ANOV1
      PRINT 705,(Y(I,J,K),K=1,KK)                                         ANOV1
  705 FORMAT(F12.4)                                                       ANOV1
  704 CONTINUE                                                            ANOV1
  703 CONTINUE                                                            ANOV1
      PRINT 1000,JOB(3)                                                   ANOV1
      CALL ANOV2NE(MAXT,MAXB,ITOT,JTOT,A,B,AP,Q,N,W,V,WW,VV,Y,NSUMI,      ANOV1
     1  SUMYI,NSUMJ,SUMYJ,SUMYIJ,TAUHAT,BETHAT,THAT,BHAT,SUMIJ,MAXT1,     ANOV1
     2   MAXB1)                                                           ANOV1
      IF(IWT.LT.0) GO TO 999                                              ANOV1
      ALPHA=.05                                                           ANOV1
  797 FORMAT(/////@0 RANKED MEAN CONTRASTS(S-METHOD) ON @,A8,             ANOV1
     2          @ ASSUMING NO INTERACTION@/                               ANOV1
     3          @ AT THE @,F5.3,@ SIGNIFICANCE LEVEL @///)                ANOV1
  798 FORMAT(@1@,8A10)                                                    ANOV1
  799 FORMAT(/////@0 RANKED MEAN CONTRASTS(S-METHOD) ON @,A8,             ANOV1
     2          @ AT THE @,F5.3,@ SIGNIFICANCE LEVEL @///)                ANOV1
      WRITE(6,798) IDEN                                                   ANOV1
      WRITE(6,797) NAMET,ALPHA                                            ANOV1
      CALL SCHEFE(ITOT,TAUHAT,WIT,ITHT,ALPHA,KOE,WW,TWOAVT)               ANOV1
      WRITE(6,799) NAMET,ALPHA                                            ANOV1
      CALL SCHEFE(ITOT,THAT,WIT,ITHT,ALPHA,KOE,WW,TWOWT)                  ANOV1
      WRITE(6,797) NAMEB,ALPHA                                            ANOV1
      CALL SCHEFE(JTOT,BETHAT,WIT,ITHT,ALPHA,KOE,VV,TWOAVB)               ANOV1
      WRITE(6,799) NAMEB,ALPHA                                            ANOV1
      CALL SCHEFE(JTOT,BHAT,WIT,ITHT,ALPHA,KOE,VV,TWOWT)                  ANOV1
  999 PRINT 1000,JOB(3)                                                   DEC10
      RETURN                                                              DEC10
  200 FORMAT(10X,F12.4,2X,2A1)                                            STAT
  300 FORMAT(13H0GRAND MEAN =,F10.3,   8H     SD =,F10.3,7H     N =,I3)   STAT
  400 FORMAT(I10,F12.4,2X,A4,2X,A2)                                       STAT
  900 FORMAT( 7H0MEAN =,F10.3,  8H     SD =,F10.3,7H     N =,I3//)        STAT
      END                                                                 STAT
      SUBROUTINE MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                 MESIG
      DIMENSION LTEXT(1)                                                  MESIG
      NN = 0                                                              MESIG
      SUM = 0.0                                                           MESIG
      SSQ = 0.0                                                           MESIG
      IF(NFIRST-NLAST) 10,10,90                                           APR24
   10 DO 140 I=NFIRST,NLAST                                               MESIG
      NSLOT = 1                                                           MESIG
      CALL OTEST(I,SUM,SSQ,NN,LTEXT)                                      MESIG
  140 CONTINUE                                                            MESIG
      IF(NN.EQ.0) GO TO 90                                                DEC10
      SMEAN = SUM/NN                                                      MESIG
      SIGMA=0.                                                            DEC10
      IF(NN.EQ.1) RETURN                                                  DEC10
      IF((NN*SSQ-SUM*SUM).LE.0.) RETURN                                   DEC10
      SIGMA = ((NN*SSQ - SUM*SUM)/(NN*(NN - 1)))**0.5                     MESIG
      RETURN                                                              MESIG
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   90 SMEAN = 0.0                                                       MESIG
      SIGMA = 0.0                                                       MESIG
      RETURN                                                            MESIG
      END                                                               MESIG
      SUBROUTINE OTEST(I,SUM,SSQ,NN,LTEXT)                              OTEST
      DIMENSION LTEXT(1)                                                OTEST
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XREDUC
      DATA IZ/4H0.00/, ISS/4HSKIP/, INV/4HINVL/                         OTEST
      DATA IBLANK/4H    /                                               JAN25
      IF(XDATA(I)) 310,410,510                                          OTEST
  310 IXT = -XDATA(I) + 0.5                                             OTEST
      IF(IXT - 2) 315,312,315                                           OTEST
  312 LTEXT(I) = IZ                                                     OTEST
      NN = NN + 1                                                       OTEST
      RETURN                                                            OTEST
  315 LTEXT(I) = ISS                                                    OTEST
      RETURN                                                            OTEST
  410 LTEXT(I) = INV                                                    OTEST
      RETURN                                                            OTEST
  510 NN = NN + 1                                                       OTEST
      LTEXT(I) = IBLANK                                                 OTEST
      SUM = SUM + XDATA(I)                                              OTEST
      SSQ = SSQ + XDATA(I)*XDATA(I)                                     OTEST
      RETURN                                                            OTEST
      END                                                               OTEST
      SUBROUTINE UERTST                                                 UERTST
      RETURN                                                            UERTST
      END                                                               UERTST
      SUBROUTINE  STPLOT(LOOP,NOBST,NSLOT,IWORD,KSTUDY,KTYPE,KMAN,KTEST,STPLOT
     X SMEAN,SIGMA)                                                     STPLOT
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XREDUC
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)           XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   STPLOT
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           STPLOT
      DIMENSION YDATE(200),XP(3)                                        REDUCE
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3)       STPLOT
C     REAL*8 MSTUDY,MTYPE,MMAN,MTEST                                    STPLOT
      REAL   MSTUDY,MTYPE,MMAN,MTEST                                    STPLOT
      REAL KSTUDY, KTYPE, KMAN, KTEST, NITS                             STPLOT
      DIMENSION NSMAN(7)                                                STPLOT
      EQUIVALENCE(YDATE,T)                                              STPLOT
      DATA NSMAN/4,9,8,0,1,2,3/                                         STPLOT
      IF(NOBST - 1) 911,911,1                                           STPLOT
    1 MFIRST = MDATE(1)                                                 STPLOT
      DO 10 II=1,NOBST                                                  STPLOT
      IF(MDATE(II) - MFIRST) 9,10,10                                    STPLOT
    9 MFIRST = MDATE(II)                                                STPLOT
   10 YDATE(II) = MDATE(II)                                             STPLOT
      J1 = NOBST + 1                                                    STPLOT
      J2 = NOBST + 2                                                    STPLOT
      CALL SCALE(XDATA, 3.0,NOBST,1)                                    STPLOT
C     XDATA(NOBST + 1) = 0.0                                            STPLOT
      IF(XDATA(J2)) 911,911,11                                          STPLOT
   11 IG = LSTUDY(1)                                                    STPLOT
      YDATE(NOBST + 1) = DATESC(1,IG)                                   STPLOT
      YDATE(NOBST + 2) = 24.0                                           STPLOT
      UP = (DATESC(2,IG) - DATESC(1,IG))/YDATE(NOBST + 2)               STPLOT
      DOWN=(DATESC(3,IG) - DATESC(1,IG))/YDATE(NOBST + 2)               STPLOT
      XP(1) = 0.1                                                       STPLOT
      XP(2) = 0.1+ UP                                                   STPLOT
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                                                                        STPLOT
      XP(3) = 0.1+ DOWN                                                 STPLOT
      NTIC = 3                                                          STPLOT
      CALL TEXT(LSTUDY(1), LTYPE(1), LMAN(1), LTEST(1),                 STPLOT
     X KSTUDY, KTYPE, KMAN, KTEST, NITS)                                STPLOT
      KS = KSKIP - KSKIP/3*3                                            STPLOT
      IF(KS) 208,108,208                                                STPLOT
C 108 CALL PLOT(4.25,10.5,-3)                                            STPLOT
  108 CALL PLOT(8.50,10.5,-3)                                            STPLOT
      FPN = LTYPE(1)                                                    STPLOT
      CALL SYMBOL(0.30,-.4,0.10,KSTUDY    , 0.0, 8)                     STPLOT
      CALL SYMBOL(1.20,-.4,0.10, KTEST    , 0.0, 8)                     STPLOT
      CALL SYMBOL(2.00,-.4,0.10,4HTYPE, 0.0, 4)                         STPLOT
      CALL NUMBER(2.40,-.4,0.10,FPN,0.0,-1)                             STPLOT
      CALL SYMBOL(2.60,-.4,0.10,IWORD,0.0,10)                           STPLOT
  208 CALL PLOT(0.0,-3.5,-3)                                            STPLOT
      CALL AXIS(0.0,0.0,12H JULIAN DATE,                                STPLOT
     1   -12, 4.0,00.0,YDATF(J1),YDATE(J2),-1,4,3)                      STPLOT
C     CALL AXIS (X,Y,BCD,NC,SIZE,THETA,YMIN,DY,NDEC,NLAB,NTIC)          STPLOT
C     CALL AXIS(0.0,0.0,16H       DATA VALUE,16,3.0,  90.0, Y(J1),Y(J2)) STPLOT
      CALL AXIS(0.0,0.0,NITS    , 8,3.0,  90.0, XDATA(J1),              STPLOT
     1 XDATA(J2), -1,  4, 1)                                            STPLOT
      FPN = LMAN(1)                                                     STPLOT
      CALL SYMBOL(0.10,3.01,0.07,KMAN, 0.0, 3)                          STPLOT
      DO 308 JJ=1,3                                                     STPLOT
      KG = 4 - JJ                                                       STPLOT
      CALL NUMBER(XP(KG), 2.89, 0.07, SSMEAN(KG), 0.0, 2)               STPLOT
  308 CALL NUMBER(XP(KG), 2.77, 0.07, SSIGMA(KG), 0.0, 2)               STPLOT
      CALL PLOT(UP,0.0,3)                                               STPLOT
      CALL PLOT(UP,3.0,2)                                               STPLOT
      CALL PLOT(DOWN,3.0,3)                                             STPLOT
      CALL PLOT(DOWN,0.0,2)                                             STPLOT
  708 LL = NSMAN(LMAN(1))                                               STPLOT
      CALL LINE(YDATE,XDATA,NOBST,1, 0,LL)                              STPLOT
  811 CONTINUE                                                          STPLOT
      KSKIP = KSKIP + 1                                                 STPLOT
  911 RETURN                                                            STPLOT
      END                                                               STPLOT
      SUBROUTINE TEXT(LSTUDY,LTYPE,LMAN,LTEST,NSTUDY,NTYPE,NMAN,NTEST,  TEXT
     1 NITS)                                                            TEXT
C     REAL*8 KSTUDY,MSTUDY(6),KTEST,MURN(124),MBLU(24),MITS(124),       TEXT
      REAL   KSTUDY,MSTUDY(5),KTEST,MURN(124),MBLU(24),MITS(124),       TEXT
     1MITSB(24),KTYPE,MTYPE(15),MM,KITS                                 TEXT
      REAL NSTUDY, NTYPE, NMAN, NTEST, KMAN, MMAN(9), NITS              TEXT
      DATA MSTUDY/8HSMEAT   ,8HSKYLAB 2,8HSKYLAB 3,8HSKYLAB 4,8HAPOLLO17TEXT
     1/                                                                 TEXT
      DATA MMAN/4HCDR ,4HPLT ,4HSPT ,4HC1  ,4HC2  ,4HC3  ,4HC4  ,       TEXT
     X4HC5  ,4HC6  /                                                    TEXT
      DATA (MURN(I),I=1,107)                                            TEXT
     X          /8HEPI     ,8HNOREPI  ,8HADH     ,8HHYDRO   ,8HALDO    ,TEXT
     X8H17OH    ,8HOSMO    ,8HNA      ,8HK       ,8HMG      ,8HPO4     ,TEXT
     X8HCA      ,8HCL      ,8HH       ,8HSP.GR.  ,8HCREAT   ,8HURICACID,TEXT
     X8HB       ,8HSI      ,8HFE      ,8HAL      ,8HMO      ,8HCU      ,TEXT
     X8HZN      ,8HTI      ,8HNI      ,8HSR      ,8HCR      ,8HBL      ,TEXT
     X8HMN      ,8HLI      ,8HRB      ,8HPD      ,8HAND     ,8HETIO    ,TEXT
     X8HDHEA    ,8H11=0 AND,8H11=0ETIO,8H11OH AND,8H11OHETIO,8HTOTAL   ,TEXT
     X8HLYS     ,8HHIS     ,8HNH3     ,8HARG     ,8HHYP     ,8HASP     ,TEXT
     X8HTHR     ,8HSER     ,8HGLU     ,8HPRO     ,8HGLY     ,8HALA     ,TEXT
     X8HCYS/2   ,8HVAL     ,8HMET     ,8HILE     ,8HLEU     ,8HTYR     ,TEXT
     X8HPHE     ,8HHLYS    ,8HGAMMA-AB,8HORN     ,8HETH     ,8HNH3     ,TEXT
     X8HLYS     ,8H1-CH3HIS,8HHIS     ,8H3-CH3HIS,8HANS     ,8HTRY     ,TEXT
     X8HCRE     ,8HCAR     ,8HARG     ,8HPSER    ,8HPETN    ,8HTYR     ,TEXT
     X8HUREA    ,8HHYP     ,8HASP     ,8HTHR     ,8HSER     ,8HASP NH2 ,TEXT
     X8HGLU NN2 ,8HSAR     ,8HPRO     ,8HGLU     ,8HCIT     ,8HGLC NH2 ,TEXT
     X8HGLY     ,8HALA     ,8HALPHA-AA,8HALPHA-AB,8HVAL     ,8HCYS/2   ,TEXT
     X8HCYT     ,8HMET     ,8HILE     ,8HLEU     ,8HTYR     ,8HPHE     ,TEXT
     X8HB-ALA   ,8HB-AIB   ,8H5HIAA   ,8H        ,8H        ,8H        /JAN25
      DATA (MURN(I),I=108,124)/                                          TEXT
     X8H        ,8H        ,8H        ,8H        ,8H        ,8H        ,TEXT
     X8H        ,8H        ,8HCALORIES,8HPROTEIN ,8HDIET CA ,8HDIET P  ,TEXT
     X8HDIET NA ,8HDIET MG ,8HDIET K  ,8HDIET H20,8HWEIGHT  /           TEXT
      DATA MBLD /8HHYDRO   ,8HALDO    ,8HHGH     ,8HANGIO   ,8HINSULIN ,TEXT
     X8HT4      ,8HACTH    ,8HADH     ,8HPTH     ,8HCAL     ,8HVIT.D.  ,TEXT
     X8HTSH     ,8HOSMO    ,8HNA      ,8HK       ,8HMG      ,8HPO4     ,TEXT
     X8HCA      ,8HCL      ,8HGLU     ,8HTP      ,8HTESTOS  ,8H        ,JAN25
     X8H        /                                                        TEXT
      DATA (MITS(I),I=1,107)                                             TEXT
     X          /8HUG/TV   ,8HUG/TV   ,8HMU/TV   ,8HUG/TV   ,8HUG/TV   ,TEXT
     X8HMG/TV   ,8HMOSM/TV ,8HMEQ/TV  ,8HMEQ/TV  ,8HMEQ/TV  ,8HMG/TV   ,TEXT
     X8HMEQ/TV  ,8HMEQ/TV  ,8HMLO     ,8H        ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,TEXT
     X8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,TEXT
     X8HUG/ML   ,8HUG/ML   ,8HUG/ML   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HTMG/TV  ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMMG/TV  ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMMG/TV  ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMMG/TV  ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,TEXT
     X8HMG/TV   ,8HMG/TV   ,8HMG/TV   ,8H        ,8H        ,8H        /JAN25
      DATA (MITS(I),I=108,124)/                                          TEXT
     X8H        ,8H        ,8H        ,8H        ,8H        ,8H        ,TEXT
     X8H        ,8H        ,8HKCAL    ,8HGRAMS   ,8HMG      ,8HMG      ,TEXT
     X8HMG      ,8HMG      ,8HMG      ,8HML      ,8HLBS.    /           TEXT
      DATA MITSB/8HUG/100ML,8HPG/ML   ,8HNG/ML   ,8HMUG/ML/H,8HUU/ML   ,TEXT
     X8HUG/100ML,8H        ,8H        ,8HPG/ML   ,8HPG/ML   ,8HNG/ML   ,TEXT
     X8H        ,8HMOSM/L  ,8HNEQ/L   ,8HNEQ/L   ,8HMG PC   ,8HMG PC   ,JAN25
     X8HMG PC   ,8HMG PC   ,8HMG PC   ,8HMG PC   ,8HUG/TV   ,8H        ,JAN25
     X8H        /                                                        TEXT
      NSTUDY = MSTUDY(LSTUDY)                                            TEXT
      NMAN = MMAN(LMAN)                                                  TEXT
      IF(LTEST - 400) 10,20,20                                           TEXT
   10 KTEST = MBLD(LTEST - 299)                                          TEXT
      KITS = MITSB(LTEST-299)                                            TEXT
      GO TO 30                                                           TEXT
   20 KTEST = MURN(LTEST - 399)                                          TEXT
      KITS = MITS(LTEST-399)                                             TEXT
   30 NTEST = KTEST                                                      TEXT
      NITS = KITS                                                        TEXT
      RETURN                                                             TEXT
      END                                                                TEXT
      SUBROUTINE KRUSWAL(XIN,ID1,ID2IN,N,NCEN,JCP,K,NL,NC,IP2)           SETWRK
C     THIS PROGRAM CALCULATES  A  GENERALIZED KRUSKAL-WALLIS K-SAMPLE    KRUSWAL
C     TEST. WHEN K=2, THE TEST IS EQUAL TO GEHAN@S GENERALIZED WILCOXON  KRUSWAL
C     TEST. CALCULATIONS FOLLOW THE PROCEDURES GIVEN BY MANTEL (BIOMETRICKRUSWAL
C     MARCH 1967)                                                        KRUSWAL
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C                                                                         KRUSWAL
C    IN CASE OF TWO-SAMPLE, IF THE SAMPLE SIZES ARE DIFFERENT, IT IS      KRUSWAL
C    SUGGESTED TO NAME THE ONE WITH LESS OBSERVATIONS SAMPLE 1.           KRUSWAL
C     CALL NKRUSWAL(X,ID1,ID2,NALL,NC,JOP,NCOND,NUNCEN,NCEN)              KRUSWAL
C                                                                         KRUSWAL
C     X(I),I=1,NALL      ARRAY CONTAINING ALL OBS IN THE SAMPLES          KRUSWAL
C      ID1(I)=1          ITH OBS IS UNCENSORED                            KRUSWAL
C            =0          ITH OBS IS CENSORED                              KRUSWAL
C      ID2(I)=J          ITH OBS IS FROM JTH SAMPLE                       KRUSWAL
C      NALL              TOTAL NO OF OBS                                  KRUSWAL
C      NC                TOTAL NO OF CENSORED OBS                         KRUSWAL
C      JOP=1             PRINT INFO                                       KRUSWAL
C         =0             DO NOT PRINT                                     KRUSWAL
C      NCOND             NO OF SAMPLES                                    KRUSWAL
C      NUNCEN(I)         NO OF UNCENSORED OBS IN SAMPLE I                 KRUSWAL
C      NCEN(I)           NO OF CENSORED OBS IN SAMPLE I                   KRUSWAL
      DIMENSION XIN(1),ID1(1),ID2IN(1),NU(6),NC(6),XY(120),ID2(120)       SETWRK
      DIMENSION R1( 600),R2( 600)                                         KRUSWAL
C                                                                         KRUSWAL
C    MAXIMUM NO. OF SAMPLES = 6.                                          KRUSWAL
C    TOTAL NUMBER OF OBSERVATIONS ALLOWED = 600.                          KRUSWAL
C    K = NO. OF SAMPLES                                                   KRUSWAL
C                                                                         KRUSWAL
C     MOVE INCOMMING ARRAYS TO WORK ARRAYS                                SETWRK
      DO 10 I=1,N                                                         SETWRK
      XY(I)=XIN(I)                                                        SETWRK
      ID2(I)=ID2IN(I)                                                     SETWRK
   10 CONTINUE                                                            SETWRK
C                                                                         KRUSWAL
C    ORDER OBS. IN ASCENDING ORDER                                        KRUSWAL
C                                                                         KRUSWAL
      CALL SORT2(XY,N,ID1,ID2)                                            KRUSWAL
C    COMPUTATION OF R1                                                    KRUSWAL
C       STEPS 1 AND 2 : RANK FROM LEFT TO RIGHT, OMITTING RIGHT CENSOREDKRUSWAL
C                       VALUES. ASSIGN NEXT HIGHER RANK TO RIGHT          KRUSWAL
C                       CENSORED VALUES                                   KRUSWAL
C                                                                         KRUSWAL
      IRANK=0                                                             KRUSWAL
      DO 90I=1,N                                                          KRUSWAL
      IF (ID1(I).EQ.0) GO TO 101                                          KRUSWAL
      IRANK=IRANK+1                                                       KRUSWAL
      R1(I)=IRANK                                                         KRUSWAL
      GO TO 90                                                            KRUSWAL
 101  R1(I)=IRANK+1                                                       KRUSWAL
  90  CONTINUE                                                            KRUSWAL
C                                                                         KRUSWAL
C       STEP 3 : REDUCE  THE RANK OF TIED OBSERVATIONS TO THE LOWEST      KRUSWAL
C                RANK FOR THE VALUE                                       KRUSWAL
C                                                                         KRUSWAL
      K1=N-1                                                              KRUSWAL
      L1=1                                                                KRUSWAL
 12   IF (XY(L1).NE.XY(L1+1)) GO TO 11                                    KRUSWAL
      JEMP=ID1(L1)*ID1(L1+1)                                              KRUSWAL
      IF(JEMP .EQ. 0) GO TO 11                                            KRUSWAL
      R1(L1+1)=R1(L1)                                                     KRUSWAL
      IF (L1.EQ.K1) GO TO 13                                              KRUSWAL
      L1=L1+1                                                             KRUSWAL
      GO TO 12                                                            KRUSWAL
 11   IF (L1.EQ.K1) GO TO 13                                              KRUSWAL
      L1=L1+1                                                             KRUSWAL
      GO TO 12                                                          KRUSWAL
 13   CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C     COMPUTATION OF R2                                                 KRUSWAL
C        STEP 1 : RANK FROM RIGHT TO LEFT                               KRUSWAL
C                                                                       KRUSWAL
      DO 14 I=1,N                                                       KRUSWAL
 14   R2(I)=N-I+1                                                       KRUSWAL
C                                                                       KRUSWAL
C        STEP 2 : REDUCE THE RANK OF TIED OBSERVATIONS TO THE LOWEST RANKKRUSWAL
C                 FOR THE VALUE                                         KRUSWAL
C                                                                       KRUSWAL
      L1=N                                                              KRUSWAL
 22   IF (XY(L1).NE.XY(L1-1)) GO TO 21                                  KRUSWAL
      JEMP=ID1(L1)*ID1(L1-1)                                            KRUSWAL
      IF (JEMP .EQ. 0) GO TO 21                                         KRUSWAL
      R2(L1-1)=R2(L1)                                                   KRUSWAL
      IF (L1.EQ. 2) GO TO 23                                            KRUSWAL
      L1=L1-1                                                           KRUSWAL
      GO TO 22                                                          KRUSWAL
 21   IF (L1.EQ. 2) GO TO 23                                            KRUSWAL
      L1=L1-1                                                           KRUSWAL
      GO TO 22                                                          KRUSWAL
 23   CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C        STEP 3 : REDUCE THE RANK OF RIGHT CENSORED OBSERVATIONS TO UNITYKRUSWAL
C                                                                       KRUSWAL
      IF (NCEN .EQ. 0) GO TO 501                                        KRUSWAL
      DO 24 I=1,N                                                       KRUSWAL
      IF (ID1(I) .EQ. 1) GO TO 24                                       KRUSWAL
      R2(I)=1.                                                          KRUSWAL
 24   CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C     COMPUTE FINAL SCORES -R1(I)                                       KRUSWAL
C                                                                       KRUSWAL
 501  CONTINUE                                                          KRUSWAL
      DO 25 I=1,N                                                       KRUSWAL
 25   R1(I)=R1(I)-R2(I)                                                 KRUSWAL
      IF(JOP.NE.1) GO TO 37                                             KRUSWAL
      PRINT 30                                                          KRUSWAL
 30   FORMAT(1H0,8X,@I@,8X,@OBSERVATIONS@,8X,@SAMPLE@,8X,@SCORES@)      KRUSWAL
      DO 31 I=1,N                                                       KRUSWAL
      IF (ID1(I).EQ.0) GO TO 34                                         KRUSWAL
      PRINT 33, I,XY(I),ID2(I),R1(I)                                    KRUSWAL
      GO TO 31                                                          KRUSWAL
   34 PRINT 35, I,XY(I),ID2(I),R1(I)                                    KRUSWAL
 33   FORMAT(1H ,6X,I3,7X,F8.1,15X,I2,12X,F6.0)                         KRUSWAL
 35   FORMAT(1H ,6X,I3,7X,F8.1,1H+,14X,I2,12X,F6.0)                     KRUSWAL
 31   CONTINUE                                                          KRUSWAL
   37 PRINT 36                                                          KRUSWAL
 36   FORMAT(1H0)                                                       KRUSWAL
      IF (K.GT.2) GO TO 200                                             KRUSWAL
      CALL TWOSPL(R1,ID2,N,NU,NC,IP2)                                   FIX2
      GO TO 1000                                                        KRUSWAL
 200  CALL AKSPL(K,N,R1,NU,NC,ID2)                                      KRUSWAL
 1000 CONTINUE                                                          KRUSWAL
      RETURN                                                            KRUSWAL
      END                                                               KRUSWAL
      SUBROUTINE SORT2(X,N,ID,IC)                                       SORT2
      DIMENSION X(1),ID(1),IC(1)                                        SORT2
      DO 1 I=1,N                                                        SORT2
      J=N-I+1                                                           SORT2
      JJ=J-1                                                            SORT2
      IF (JJ .LT. 1)GO TO 1                                             SORT2
      DO 2 K=1,JJ                                                       SORT2
      IF (X(K).NE.X(J)) GO TO 3                                         SORT2
      IF (ID(K)-ID(J)) 4,2,2                                            SORT2
 3    IF (X(K) .LT. X(J)) GO TO 2                                       SORT2
 4    X1=X(J)                                                           SORT2
      ITEM=ID(J)                                                        SORT2
      ICTE=IC(J)                                                        SORT2
      X(J)=X(K)                                                         SORT2
      ID(J)=ID(K)                                                       SORT2
      IC(J)=IC(K)                                                       SORT2
      X(K)=X1                                                           SORT2
      ID(K)=ITEM                                                        SORT2
      IC(K)=ICTE                                                        SORT2
 2    CONTINUE                                                          SORT2
 1    CONTINUE                                                          SORT2
      RETURN                                                            SORT2
      END                                                               SORT2
      SUBROUTINE TWOSPL(R1,ID2,N,NU,NC,IP2)                             FIX2
      DIMENSION ID2(1),R1(1),NU(1),NC(1)                                TWOSPL
C     DATA ONE,TWO/@ONE@,@TWO@/                                         TWOSPL
      DATA ONE/10HONE        /                                          TWOSPL
      DATA TWO/10HTWO        /                                          TWOSPL
      WW=0.                                                             TWOSPL
      DO 26 I=1,N                                                       TWOSPL
      IF(ID2(I).EQ.IP2) GO TO 26                                        FIX2
      WW=WW+R1(I)                                                       TWOSPL
 26   CONTINUE                                                          TWOSPL
      SUM=0.                                                            TWOSPL
      DO 27 I=1,N                                                       TWOSPL
 27   SUM=SUM+R1(I)**2                                                  TWOSPL
      XN1=NU(1)+NC(1)                                                   TWOSPL
      XN2=NU(2)+NC(2)                                                   TWOSPL
      XN=N                                                              TWOSPL
      VAR=XN1*XN2*SUM/(XN*(XN-1.))                                      TWOSPL
      VAR=SQRT(VAR)                                                     TWOSPL
C                                                                       TWOSPL
C    CALCULATE CONTINUITY CORRECTION                                    TWOSPL
C                                                                       TWOSPL
      SIGN=-1.                                                          TWOSPL
      IF (WW.LT.0.) SIGN=1.                                             TWOSPL
      COR=.5                                                            TWOSPL
      IF (FLOAT((NC(1)+NC(2))/N) .LT. 0.2) COR=1.0                      TWOSPL
      COR=SIGN*COR                                                      TWOSPL
      IF (WW.EQ.0.) COR=0.                                              TWOSPL
C                                                                       TWOSPL
C    CALCULATE FINAL W SCORE AND PROBABILITY.                           TWOSPL
C                                                                       TWOSPL
      WSCORE=(WW+COR)/VAR                                               TWOSPL
      WSC=WSCORE                                                        TWOSPL
      IF (ABS(WSCORE)-3.1) 305,305,302                                  TWOSPL
 305  P1=100.*(1.-PROB(WSC))                                            TWOSPL
      GO TO 301                                                         TWOSPL
 302  P1=0.1                                                            TWOSPL
 301  CONTINUE                                                          TWOSPL
      P2=P1*2.                                                          TWOSPL
      P2=AMIN1(P2,100.)                                                 TWOSPL
      PRINT 600, WW,VAR,WSCORE                                          TWOSPL
  600 FORMAT(1H0,3X,1HW,7X,8HST. DEV.,3X,10HASYMPTOTIC/25X,6HWSCORE/1X,FTWOSPL
     19.0,F8.2,7X,F5.2)                                                 DEC10
      PRINT 601, WSCORE,P2,TWO                                          TWOSPL
      PRINT 601, WSCORE,P1,ONE                                          TWOSPL
  601 FORMAT(1X,F5.2,1X,@IS SIGNIFICANT AT THE @, F7.1,@ PERCENT LEVEL -TWOSPL
     1@,A3,@ TAILED TEST@)                                              TWOSPL
      PRINT 602                                                         TWOSPL
  602 FORMAT(1H0)                                                       TWOSPL
      RETURN                                                            TWOSPL
      END                                                               TWOSPL
      SUBROUTINE AKSPL(K,N,R1,NU,NC,ID2)                                AKSPL
      DIMENSION R1(1),NU(1),NC(1),W(6),ID2(1)                           AKSPL
C                                                                       AKSPL
C     TEST STATISTIC FOR K(GREATER THAN 2)-SAMPLE CASE                  AKSPL
C                                                                       AKSPL
      DO 201 I=1,K                                                      AKSPL
  201 W(I)=0.                                                           AKSPL
      DO 202 IJ=1,N                                                     AKSPL
      I=ID2(IJ)                                                         AKSPL
  202 W(I)=W(I)+R1(IJ)                                                  AKSPL
      T=0.                                                              AKSPL
      DO 203 IJ=1,N                                                     AKSPL
  203 T=T+R1(IJ)**2                                                     AKSPL
      B=0.                                                              AKSPL
      PRINT 300                                                         AKSPL
  300 FORMAT(1H0,@SAMPLE@,8X,@W(I)@,10X,@N(I)@)                         AKSPL
      DO 204 I=1,K                                                      AKSPL
      UC=NU(I)+NC(I)                                                    AKSPL
      PRINT 301, I,W(I),UC                                              AKSPL
  301 FORMAT(1H ,3X,I1,7X,F8.0,7X,F5.0)                                 AKSPL
  204 B=B+(W(I)**2/UC)                                                  AKSPL
      PRINT 302, B,T                                                    AKSPL
  302 FORMAT(1H0,@B =@,F12.2,5X,@T =@,F10.0)                            AKSPL
      WSCORE=(B/T)*FLOAT(N-1)                                           AKSPL
C                                                                       AKSPL
C     WSCORE HAS CHI-SQUARE DISTRIBUTION WITH (K-1) D. F.               AKSPL
C                                                                       AKSPL
      WS=WSCORE                                                         AKSPL
      XK=K-1                                                            AKSPL
      XM=WS/2.                                                          AKSPL
      IC=XK/2.                                                          AKSPL
      SWS=SQRT(WS)                                                      AKSPL
      EM=1./EXP(XM)                                                     AKSPL
      PRINT 205, WSCORE                                                 AKSPL
  205 FORMAT(1H0,@WSCORE = @,F7.3)                                      AKSPL
      XK2=XK/2.                                                         AKSPL
      IF ((XK2-FLOAT(IC)).NE.0) GO TO 500                               AKSPL
      SUM=0.                                                            AKSPL
      PROD=1.                                                           AKSPL
      DO 1 I=1,IC                                                       AKSPL
      IF (I.GT.1) GO TO 2                                               AKSPL
      XI=1                                                              AKSPL
      GO TO 3                                                           AKSPL
    2 XI=I-1                                                            AKSPL
    3 PROD=XI*PROD                                                      AKSPL
      TERM=XM**(I-1)/PROD                                               AKSPL
    1 SUM=SUM+TERM                                                      AKSPL
      CPROB=SUM*EM                                                      AKSPL
      P=100.*CPROB                                                      AKSPL
      IF (P.LT.0.1000) GO TO 10                                         AKSPL
      PRINT 206, WSCORE,P                                               AKSPL
  206 FORMAT(1H0,F7.3,@ IS SIGNIFICANT AT THE @,F5.1,@ PERCENT LEVEL@)  AKSPL
      GO TO 1000                                                        AKSPL
   10 P=0.10                                                            AKSPL
      PRINT 12, WSCORE,P                                                AKSPL
   12 FORMAT(1H0,F7.3,@ IS SIGNIFICANT WITH PROBABILITY LESS THAN @,F7.3AKSPL
     1,@ PERCENT LEVEL@)                                                AKSPL
      GO TO 1000                                                        AKSPL
  500 GAMH=1.7724538509                                                 AKSPL
      TERM=SQRT(XM)/(0.5*GAMH)                                          AKSPL
      SUM=TERM                                                          AKSPL
      NR=(XK-3.)/2.                                                     AKSPL
      IF(NR.EQ.0) GO TO 502                                             AKSPL
      DO 501 I=1,NR                                                     AKSPL
      XI=I                                                              AKSPL
      TERM=TERM*2.*XM/(2.*XI+1.)                                        AKSPL
  501 SUM=SUM+TERM                                                      AKSPL
  502 CHISQ=(SUM*EM)*100.                                               AKSPL
      P2=100.*2.*(1.-PROB(SWS))                                         AKSPL
      P=P2+CHISQ                                                        AKSPL
      IF (P.LT.0.0005) GO TO 14                                         AKSPL
      PRINT 206,  WSCORE,P                                              AKSPL
      GO TO 1000                                                        AKSPL
   14 P=0.001                                                           AKSPL
      PRINT 12,  WSCORE,P                                               AKSPL
 1000 CONTINUE                                                          AKSPL
      RETURN                                                            AKSPL
      END                                                               AKSPL
      FUNCTION PROB(X)                                                  PROB
C                                                                       PROB
C        THIS FUNCTION ROUTINE COMPUTES                                 PROB
C                       DISTRIBUTION FUNCTION(X)        IF X GE 0       PROB
C                   1 - DISTRIBUTION FUNCTION(X)        IF X LT 0       PROB
C        OF A ST. NORMAL VARTABLE USING APPROXIMATION 26.2.19  P.932    PROB
C        HANDBOOK OF MATH. FUNCTIONS                                    PROB
      DATA D1,D2,D3,D4,D5,D6/.0498673470,.0211410061,.0032776263,.000038PROB
     10036,.0000488906,.0000053830/                                     PROB
      IF (X) 20,30,40                                                   PROB
   30 PROB=0.5                                                          PROB
      RETURN                                                            PROB
   20 X1=-X                                                             PROB
      GO TO 50                                                          PROB
   40 X1=X                                                              PROB
   50 A=1.+X1*(D1+X1*(D2+X1*(D3+X1*(D4+X1*(D5+X1*D6)))))                PROB
      PROB=1.-0.5*A**(-16)                                              PROB
   60 CONTINUE                                                          PROB
      RETURN                                                            PROB
      END                                                               PROB
      SUBROUTINE FFOUT(S1, S2, N1, N2,FDAT, PRB)                        FFOUT
      FDAT = (S1/N1)/(S2/N2)                                            FFOUT
      PRB= FISH(FDAT,N1,N2)                                             FFOUT
      PRB = (1.0 - PRB)*100.                                            FFOUT
      IF(PRB - 0.1) 1,2,2                                               FFOUT
    1 PRB = 0.1                                                         FFOUT
    2 RETURN                                                            FFOUT
      END                                                               FFOUT
      FUNCTION FISH(F,N1,N2)                                            FISH
      LOGICAL E1,E2,E3                                                  FISH
       IF(N1.GE.100.AND.N2.GE.100) GOTO 9                               FISH
```

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C-----------------------------------------------------------------------FISH
C     INITIALIZATION AND SETTING OF LOGICAL SWITCHES  TO .TRUE. IF      FISH
C     THE DEGREES OF FREEDOM ARE EVEN                                   FISH
C-----------------------------------------------------------------------FISH
      E1=.FALSE.                                                        FISH
      E2=.FALSE.                                                        FISH
      E3=.FALSE.                                                        FISH
      IF(MOD(N1,2).EQ.0) E1=.TRUE.                                      FISH
      IF(MOD(N2,2).EQ.0) E2=.TRUE.                                      FISH
      X=N2/(N2+N1*F)                                                    FISH
      IF(.NOT.(E1.OR.E2)) GO TO 5                                       FISH
      IF(E1.AND..NOT.E2) GO TO 1                                        FISH
      IF(.NOT.E1.AND.E2) GO TO 2                                        FISH
      IF(N1.LE.N2) GO TO 1                                              FISH
C-----------------------------------------------------------------------FISH
C   INITIALIZATION FOR SECOND DEGREE OF FREEDOM EVEN  AND LESS THAN     FISH
C      FIRST DEGREE OF FREEDOM IF IT TOO IS EVEN                        FISH
C-----------------------------------------------------------------------FISH
    2 I=N1                                                              FISH
      N1=N2                                                             FISH
      N2=I                                                              FISH
      X=1.0-X                                                           FISH
      E3=.TRUE.                                                         FISH
C-----------------------------------------------------------------------FISH
C     INITIALIZATION FOR FIRST DEGREE OF FREEDOM EVEN AND LESS THAN     FISH
C   SECOND DEGREE OF FREEDOM IF IT IS EVEN                              FISH
C-----------------------------------------------------------------------FISH
    1 Y=1.0-X                                                           FISH
C-----------------------------------------------------------------------FISH
C     CALCULATION OF PROBABILITY FOR AT LEAST ONE DEGREE OF FREEDOM EVENFISH
C-----------------------------------------------------------------------FISH
      FISH=0.0                                                          FISH
      H=SQRT(X**N2)                                                     FISH
      M=N1/2-1                                                          FISH
      MCDC = M + 1                                                      FISH
      DO 3 ICDC=1,MCDC                                                  FISH
      I = ICDC - 1                                                      FISH
      FISH=FISH+H                                                       FISH
    3 H=(H*Y*(N2+2.*I))/(2.*(I+1.))                                     FISH
      IF(E3) GO TO 4                                                    FISH
C-----------------------------------------------------------------------FISH
C        ADJUST CALCULATED PROBABILITY IF ITS ONES COMPLEMENT WAS       FISH
C     CALCULATED ORIGINALLY                                             FISH
C-----------------------------------------------------------------------FISH
      FISH=1.0-FISH                                                     FISH
      RETURN                                                            FISH
    4 I=N1                                                              FISH
      N1=N2                                                             FISH
      N2=I                                                              FISH
      RETURN                                                            FISH
C-----------------------------------------------------------------------FISH
C     CALCULATION OF THE PROBABILITY FOR BOTH DEGREES OF FREEDOM ODD    FISH
C-----------------------------------------------------------------------FISH
    5 Y=1.0-X                                                           FISH
      H=.63661977*SQRT(X*Y)                                             FISH
      FISH=.63661977*ACOS(SQRT(X))                                      FISH
      IF(N2.EQ.1) GO TO 8                                               FISH
      M=N2-2                                                            FISH
      DO  6  I=1,M,2                                                    FISH
      FISH=FISH+H                                                       FISH
    6 H=H*X*(I+1)/(I+2)                                                    FISH
    8 IF(N1.EQ.1) RETURN                                                   FISH
      H=H*N2                                                               FISH
      M=N1-2                                                               FISH
      DO   7   I=1,M,2                                                     FISH
      FISH=FISH-H                                                          FISH
    7 H=H*Y*(N2+I)/(I+2)                                                   FISH
      RETURN                                                               FISH
    9  D1=N1                                                               FISH
       D2=N2                                                               FISH
       DT=(D1/D2)*F                                                        FISH
       DN=SQRT((2.*D2-1.)*DT)-SQRT(2.*D1-1.)                               FISH
       X=DN/SQRT(1.+DT)                                                    FISH
       FISH=PHI(X)                                                         FISH
       RETURN                                                              FISH
      END                                                                  FISH
      REAL FUNCTION PHI(X)                                                 PHI
C----------------------------------------------------------------------PHI
C                                                                          PHI
C  PHI CALCULATES THE AREA UNDER THE NORMAL CURVE                          PHI
C  A TRANSFORMATION AND J-FRACTION ARE USED ( SEE METHOD )                 PHI
C                                                                          PHI
C----------------------------------------------------------------------PHI
      LOGICAL UPPER                                                        PHI
      IF(X.LT.-13.27) GO TO 6                                              PHI
      IF(X.GT.8.5) GO TO 8                                                 PHI
      IF(X.NE.0.0) GO TO 2                                                 PHI
      PHI=0.50                                                             PHI
      RETURN                                                               PHI
    2 UPPER=X.GT.0.0                                                       PHI
      Z=     (ABS(X))                                                      PHI
      Y= 5.6418953027302E-1* EXP(- Z*Z /2.E0)                              PHI
      Z = Z /1.4142135623731E0                                             PHI
      T=0.0E0                                                              PHI
      IF( ABS(Y/Z).GT.0.0) T=Y/(Z-6.9103675618730E-6                       PHI
     1+5.0025350900390E-1/(Z+1.2386797611409E-2+7.7267300865878E-1         PHI
     2/(Z-4.3263982143053E0 +7.3456287718055E1/(Z+1.5040871364290E1        PHI
     3+6.2086245657235 6E0 /(Z+8.8971612130791E0 +4.9182171845874E1        PHI
     4/(Z-2.5108230069509E0 -2.8225972942737E0/(Z-9.7597917308472E-1       PHI
     5+2.4244213526837E1 /(Z+4.8008570125081E0 +4.9227853919002E-1         PHI
     6/(Z+7.6621170927661E0 +5.0285619125788E1/(Z-4.6529284984655E0        PHI
     7  ))))))))))                                                         PHI
      T=T/2.E0                                                             PHI
      IF(UPPER) GO TO 4                                                    PHI
      PHI=T                                                                PHI
      RETURN                                                               PHI
    4 PHI=1.0E0-T                                                          PHI
      RETURN                                                               PHI
    6 PHI = 0.0                                                            PHI
      RETURN                                                               PHI
    8 PHI = 1.0                                                            PHI
      RETURN                                                               PHI
      END                                                                  PHI
      SUBROUTINE ERROR                                                     ERROR
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,         ERROR
     +               MFUNC,IFILE,IERR                                      ERROR
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)              ERROR
      GO TO(100,200,300,400) IFILE                                         ERROR
  100 IERR = IFETCH(FITRA1,3LIPS)                                          ERROR
      CALL STOREF(FITRA1,3LIPS,0)                                          ERROR
      GO TO 500                                                         ERROR
  200 IERR = IFETCH(FITRA2,3LIRS)                                       ERROR
      CALL STOREF(FITRA2,3LIRS,0)                                       ERROR
      GO TO 500                                                         ERROR
  300 IERR = IFETCH(FITRA3,3LIRS)                                       ERROR
      CALL STOREF(FITRA3,3LIRS,0)                                       ERR
      GO TO 500                                                         ERROR
  400 IERR = IFETCH(FITRA4,3LIRS)                                       ERROR
      CALL STOREF(FITRA4,3LIRS,0)                                       ERROR
  500 IF(IERR.EQ.0) RETURN                                              ERROR
      PRINT 601,IFILE,IERR,FEE,KEF                                      ERROR
      RETURN                                                            ERROR
  601 FORMAT(* RA*,I3,* ERROR *,O10,2I10)                               ERROR
      END                                                               ERROR
      SUBROUTINE ANOV2NF (MAXT,MAXB,ITOT,JTOT,A,B,P,Q,N,W,V,WW,VV,Y,    ANOV
     2              NSUMI, SUMYI,NSUMJ,SUMYJ,SUMYIJ,TAUHAT,BETHAT,THAT, ANOV
     3              BHAT,SUMIJ,MAXT1,MAXB1)                             ANOV
C                                                                       ANOV
C         TWO-WAY ANALYSIS OF VARIANCE WITH UNEQUAL NUMBERS PER CELL    ANOV
C                                                                       ANOV
C         MODEL                                                         ANOV
C                                                                       ANOV
C     Y(I,J,K) = MU + TAU(I) + BETA(J) + INTERACTION(I,J) + ERROR(I,J,K)ANOV
C                                                                       ANOV
C                                                                       ANOV
C         MODEL ASSUMING ADDITIVITY                                     ANOV
C                                                                       ANOV
C     Y(I,J,K) = MU + TAU(I) + BETA(J) + ERROR(I,J,K)                   ANOV
C                                                                       ANOV
C                                                                       ANOV
C         SUBROUTINE ARGUMENTS                                          ANOV
C                                                                       ANO
C IN  MAXT        MAXIMUM FIRST DIMENSION OF Y,A,N,SUMYIJ               ANOV
C IN  MAXB        MAXIMUM SECOND DIMENSION OF Y,FIRST OF B              ANOV
C IN  ITOT        NUMBER OF TAU EFFECTS                                 ANOV
C IN  JTOT        NUMBER OF BETA EFFECTS                                ANOV
C     A           MAXT BY MAXT WORK ARRAY --- TAU EFFECTS  A*TAUHAT = Q ANOV
C     B           MAXB BY MAXB WORK ARRAY ---BETA EFFECTS  B*BETHAT = P ANOV
C     P           MAXT WORK VECTOR                                      ANOV
C     Q           MAXB WORK VECTOR                                      ANOV
C IN  N           MAXT BY MAXB (ACTUAL ITOT BY JTOT) NUMBERS OF SAMPLES ANOV
C                                   PER CELL                            ANOV
C     W           ITOT WEIGHTS OF TAU EFFECTS  (SEE IWT IN COMMON)      ANOV
C     V           JTOT WEIGHTS OF BETA EFFECTS (SEE IWT IN COMMON)      ANOV
C     VW          MAX(ITOT,JTOT) WORK VECTOR FOR WEIGHTS                ANOV
C IN  Y           ITOT BY JTOT BY N(I,J) ARRAY OF DATA                  ANOV
C     NSUMI       JTOT VECTOR OF SUMS OF N(I,J) -- SUMED ON I           ANOV
C     SUMYI       JTOT VECTOR OF SUMS OF Y(I,J,K) -- SUMED ON K AND I   ANOV
C     NSUMJ       ITOT VECTOR OF SUMS OF N(I,J) -- SUMED ON J           ANOV
C     SUMYJ       ITOT VECTOR OF SUMS OF Y(I,J,K) -- SUMED ON K AND J   ANOV
C     SUMYIJ      ITOT BY JTOT ARRAY OF SUM OF Y(I,J,K) -- SUMED ON K   ANOV
C     TAUHAT      ITOT VECTOR OF ESTIMATES OF TAU EFFECTS               ANOV
C     BETHAT      JTOT VECTOR OF ESTIMATES OF BETA EFFECTS              ANOV
C     X1          MAX(ITOT,JTOT) WORK VECTOR                            ANOV
C           COMMON BLOCK AOV2NF ARGUMENTS                               ANOV
C IN  IDEN        10 LENGTH VECTOR CONTAINING AOV TABLE TITLE (40 ALPHA) ANOV
C IN  NAMET       2 LENGTH VECTOR CONTAINING THE NAME OF THE TAU EFFECTS ANO
C IN  NAMEB       2 LENGTH VECTOR CONTAINING THE NAME OF THE BETA EFFECTSAN
C IN  IWT         IS 1, IF WEIGHTS W,V ARE TO BE 1/ITOT AND 1/JTOT, RESP.ANOV
C                     2, IF W,V ARE TO BE 1/NSUMJ(I),1/NSUMI(J),RESP.   ANOV
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C                   3, IF W,V CONTAIN,ON CALL TO ANOVA2NE, THE WEIGHTS  ANOV
C                     TO BE USED                                        ANOV
C                                                                       ANOV
C     THE REMAINING COMMON BLOCK VARIABLES ARE VARIABLES CALCULATED IN  ANOV
C         ONE OF THE TWO ANALYSIS OF VARIANCE TABLES PREPARED BY ANOVAZNANOV
C                                                                       ANOV
C     AOV TABLE ONE CALCULATES WITH THE TAU EFFECTS ADJUSTED FOR UNEQUALANOV
C         CELL NUMBERS.  MNSQT,MNSQE,MNSST ARE TYPED REAL AND NOT INTEGEANOV
C                                                                       ANOV
C       S.V.                    D.F.        S.S.       M.S.       F-RATIO ANOV
C                                                                       ANOV
C       MU,BETA                 JTOT       SUMSQX                       ANOV
C                                                                       ANOV
C       TAU (ADJ.)            ITOT-1        TAU       MNSQT      FRATIO ANOV
C       NO INTERACTION                                                  ANOV
C                                                                       ANOV
C       ERROR                   IERR       ERROR      MNSQE             ANOV
C       NO INTERACTION                                                  ANOV
C                                                                       ANOV
C       TAU (ADJ.)            ITOT-1        SST       MNSST      FSST   ANOV
C                                                                       ANOV
C       INTERACTION             INT         TIN        TINT      FINT   ANOV
C       EFFECT                                                          ANOV
C                                                                       ANOV
C       WITHIN CELL            ITHT        WITHT       WIT              ANOV
C       ERROR                                                           ANOV
C                                                                       ANOV
C       TOTAL                  NSUM        SUMSQY                       ANOV
C                                                                       ANOV
C                                                                       ANOV
C     AOV TABLE TWO CALCULATES WITH THE BETA EFFECTS ADJUSTED FOR       ANOV
C         UNEQUAL CELL NUMBERS.  MNSQB,MNSQBE,MNSSB ARE TYPED REAL      ANOV
C                                                                       ANOV
C       S.V.                    D.F.        S.S.       M.S.       F-RATIO ANOV
C                                                                       ANOV
C       MU,TAU                  ITOT       SUMSQT                       ANOV
C                                                                       ANOV
C       BETA (ADJ.)           JTOT-1        BETA      MNSQB      FRATB  ANOV
C       NO INTERACTION                                                  ANOV
C                                                                       ANOV
C       ERROR                   IERR       ERRORB     MNSQBE            ANOV
C       NO INTERACTION                                                  ANOV
C                                                                       ANOV
C       BETA (ADJ.)           JTOT-1        SSB       MNSSB     FSSB    ANOV
C                                                                       ANOV
C       INTERACTION             INT         BIN        BINT     FINB    ANOV
C       EFFECT                                                          ANOV
C                                                                       ANOV
C       WITHIN CELL            ITHT         WITHT      WIT              ANOV
C       ERROR                                                           ANOV
C       TOTAL                  NSUM         SUMSQY                      ANOV
C                                                                       ANOV
C                                                                       ANOV
      DIMENSION Y(MAXT,MAXB,1),N(MAXT,1),NSUMI(1),NSUMJ(1),SUMYI(1)     ANOV
     2         ,Q(1),A(MAXT1,1),TAUHAT(1),X1(10,1),SUMYJ(1)             ANOV
      DIMENSION SUMYIJ(MAXT,1),BETHAT(1),P(1),B(MAXB1,1)                ANOV
      DIMENSION  W(1), V(1), WW(1), VV(1)                               ANOV
      DIMENSION IDEN(8)                                                 ANOV
      DIMENSION  THAT(1), BHAT(1)                                       ANOV
      REAL MNSSB                                                        ANOV
      REAL MNSST                                                        ANOV
      REAL MNSQB,MNSQBE                                                 ANOV
      REAL MNSQT, MNSQE                                                 ANOV
      DIMENSION INIT(37)                                                ANOV
      EQUIVALENCE (INIT(1),SUMSQX)                                      ANOV
      COMMON / AOV2NE / IDEN,NAMET,NAMEB,IWT,SUMSQX,TAU,MNSQT,FRATIO,   ANOV
     2                  IERR,ERROR,MNSQE,SST,MNSST,FSST,INT,TIN,TINT,   ANOV
     3                  FINT,ITHT,WITHT,WIT,NSUM,SUMSQY,SUMSQT,BETA,    ANOV
     4                  MNSQB,FRATB,ERRORB,MNSQBE,SSB,MNSSB,FSSB,BIN,   ANOV
     5                  BINT,FINB,PFRAT,PFSST,PFINT,PFRATB,PFSSB,PFINB  ANOV
      DO 4 I=1,37                                                       ANOV
    4 INIT(I)=0                                                         ANOV
 1008 FORMAT(////10X, A8,@ --- WEIGHTS@/(1X,6G20.7))                    ANOV
      GO TO (210,220,240),IWT                                           ANOV
  210 WT=1./FLOAT(ITOT)                                                 ANOV
C                                                                       ANOV
C         EQUAL WEIGHTS                                                 ANOV
C                                                                       ANOV
      DO 211 I=1,ITOT                                                   ANOV
  211 W(I)=WT                                                           ANOV
      WT=1./FLOAT(JTOT)                                                 ANOV
      DO 212 J=1,JTOT                                                   ANOV
  212 V(J)=WT                                                           ANOV
      GO TO 240                                                         ANOV
C                                                                       ANOV
C         PROPORTIONAL WEIGHTS                                          ANOV
C                                                                       ANOV
  220 SSS=0.                                                            ANOV
      DO 222 I=1,ITOT                                                   ANOV
      WT=0.                                                             ANOV
      DO 221 J=1,JTOT                                                   ANO
  221 WT=WT+N(I,J)                                                      ANOV
      W(I)=1./WT                                                        ANOV
  222 SSS=SSS+W(I)                                                      ANOV
      SSS=1./SSS                                                        ANOV
      DO 225 I=1,ITOT                                                   ANOV
  225 W(I)=W(I)*SSS                                                     ANOV
      SSS=0.                                                            ANOV
      DO 224 J=1,JTOT                                                   ANOV
      WT=0.                                                             ANOV
      DO 223 I=1,ITOT                                                   ANOV
  223 WT=WT+N(I,J)                                                      ANOV
      V(J)=1./WT                                                        ANOV
  224 SSS=SSS+V(J)                                                      ANOV
      SSS=1./SSS                                                        ANOV
      DO 226 J=1,JTOT                                                   ANOV
  226 V(J)=V(J)*SSS                                                     ANOV
      GO TO 240                                                         ANOV
  240 WRITE(6,1008) NAMET,(W(I),I=1,ITOT)                               ANOV
      WRITE(6,1008) NAMEB,(V(J),J=1,JTOT)                               ANOV
  250 NSUM=0                                                            ANOV
      SUMIJ=0.                                                          ANOV
      SUMSQY = 0.0                                                      ANOV
C                                                                       ANOV
C          FORM SUM OF SQUARES AND SUM OF N                             ANOV
C                 AND SUM OF N AND OF Y OVER I                          ANOV
      DO 1 J = 1, JTOT                                                  ANO
      NSUMI(J) = 0                                                      ANOV
      SUMYI(J) = 0.0                                                    ANOV
C                                                                       ANOV
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```
      DO 1 I = 1, ITOT                                                  ANOV
      NSUM = NSUM + N(I, J)                                             ANOV
      NSUMI(J) = NSUMI(J) + N(I, J)                                     ANOV
      SUMYIJ(I,J)=0.                                                    ANOV
      K = N(I, J)                                                       ANOV
      DO 1  IK = 1, K                                                   ANOV
      SUMSQY = SUMSQY + Y(I, J, IK) * Y(I, J, IK)                       ANOV
      SUMYI(J) = SUMYI(J) + Y(I, J, IK)                                 ANOV
    1 CONTINUE                                                          ANOV
      IJTOT=ITOT*JTOT                                                   ANOV
      INT=IJTOT-ITOT-JTOT+1                                             ANOV
      ITHT=NSUM-IJTOT                                                   ANOV
      ITOTP1 = ITOT  + 1                                                ANOV
      JTOTP1 = JTOT + 1                                                 ANOV
      ITOT1=ITOT-1                                                      ANOV
      JTOT1=JTOT-1                                                      ANOV
      IERR=NSUM-ITOT-JTOT+1                                             ANOV
C                                                                       ANOV'
C     CALCULATE AOV TABLE FOR ADJUSTED TAU EFFECTS                      ANOV
C                                                                       ANOV
C        FORM SUM OF N OVER J AND BEGIN TO FORM Q TO BE USED            ANOV
C        IN SOLUTION FOR TAU                                            ANOV
C                                                                       ANOV
      DO 2 I = 1, ITOT                                                  ANOV
      NSUMJ(I) = 0                                                      ANOV
      SUMYJ(I) = 0.0                                                    ANOV
      Q(I) = 0.0                                                        ANOV
      DO 2 J = 1, JTOT                                                  ANOV
      NSUMJ(I) = NSUMJ(I) + N(I, J)                                     ANOV
      Q(I)=Q(I) + FLOAT(N(I,J)) * SUMYI(J)/FLOAT(NSUMI(J))              ANOV
      K = N(I, J)                                                       ANOV
      DO 11  IK = 1, K                                                  ANOV
      SUMYIJ(I,J)=SUMYIJ(I,J) + Y(I,J,IK)                               ANOV
   11 SUMYJ(I) = SUMYJ(I) + Y(I, J, IK)                                 ANOV
      SUMIJ=SUMIJ + SUMYIJ(I,J)                                         ANOV
      SUMYIJ(I,J)=SUMYIJ(I,J)/FLOAT(K)                                  ANOV
    2 CONTINUE                                                          ANOV
      SUMIJ=SUMIJ/FLOAT(NSUM)                                           ANOV
      WRITE(6,3000) SUMIJ                                               ANOV
      WRITE(6,3003) NAMET                                               ANOV
      WRITE(6,3001) (SUMYJ(I),I=1,ITOT)                                 ANOV
      WRITE(6,3004) NAMET                                               ANOV
      WRITE(6,3005) (NSUMJ(I),I=1,ITOT)                                 ANOV
      WRITE(6,3003) NAMEB                                               ANOV
      WRITE(6,3001) (SUMYI(J),J=1,JTOT)                                 ANOV
      WRITE(6,3004) NAMEB                                               ANOV
      WRITE(6,3005) (NSUMI(J),J=1,JTOT)                                 ANOV
      WRITE(6,3002)                                                     ANOV
      DO 500 I=1,ITOT                                                   ANOV
      WRITE(6,3001) (SUMYIJ(I,J),J=1,JTOT)                              ANOV
  500 CONTINUE                                                          ANOV
      WRITE(6,3006)                                                     ANOV
      DO 501 I=1,ITOT                                                   ANOV
      WRITE(6,3005) (N(I,J),J=1,JTOT)                                   ANOV
  501 CONTINUE                                                          ANOV
 3000 FORMAT(@0MEAN EST @,G15.7)                                        ANOV
 3001 FORMAT(1X,10G12.4)                                                ANOV
 3002 FORMAT(@0CELL MEANS@)                                             ANOV
 3003 FORMAT(@0@, A8,@ SUMS@)                                           ANOV
 3004 FORMAT(@0@, A8,@ NUMBER SUMS@)                                    ANOV
 3005 FORMAT(1X,10I12)                                                     ANOV
 3006 FORMAT(@0CELL NUMBERS@)                                              ANOV
C                                                                          ANOV
C        CALCULATE WITHIN SUMS OF SQUARES                                  ANOV
C                                                                          ANOV
      WITHT=0.                                                             ANOV
      DO 12 I=1,ITOT                                                       ANOV
      DO 12 J=1,JTOT                                                       ANOV
      K=N(I,J)                                                             ANOV
      DO 12 IK=1,K                                                         ANOV
   12 WITHT=WITHT + (Y(I,J,IK)-SUMYIJ(I,J))**2                             ANOV
      IF(ITHT.LE.0) GO TO 15                                               ANOV
      IF(WITHT.GT.0.) GO TO 112                                            ANOV
      WRITE(6,113) WITHT                                                   ANOV
  113 FORMAT(@0 ***** WITHIN CELL ERROR IS @,G15.6,@ ... PROCESSING ABORANOV
     2TED ***** @)                                                         ANOV
      IW1=-1                                                               ANOV
      RETURN                                                               ANOV
  112 WIT=WITHT/FLOAT(ITHT)                                                ANOV
C                                                                          ANOV
C         FORM THE MATRIX A AND AUGMENT IT TO ASTAR, A NONSINGULAR         ANOV
C         MATRIX IN THE FOLLOWING MANNER                                   ANOV
C                                                                          ANOV
C                             A(ITOT X ITOT)      1 (ITOT X 1)             ANOV
C                  ASTAR =                                                 ANOV
C                             1-(1 X ITOT)        0 (1 X 1)                ANOV
C                                                                          ANOV
   15 DO 3 IR = 1, ITOT                                                    ANOV
      DO 3 IS = 1, ITOT                                                    ANOV
      A(IR, IS) = 0.0                                                      ANOV
      DO 5 J = 1, JTOT                                                     ANOV
    5 A(IR,IS) = A(IR,IS) + FLOAT(N(IR,J)*N(IS,J)) / FLOAT(NSUMI(J))       ANOV
      A(IR, IS) = -A(IR, IS)                                               ANOV
      IF(IR.EQ.IS) A(IR,IS)=FLOAT(NSUMJ(IR))+A(IR,IS)                      ANOV
    3 CONTINUE                                                             ANOV
C                                                                          ANOV
C                                                                          ANOV
      DO 7 I = 1, ITOT                                                     ANOV
      A(ITOTP1, I) = 1.0                                                   ANOV
      A(I, ITOTP1) = 1.0                                                   ANOV
C                                                                          ANOV
C         FINISH CALCULATION OF Q                                          ANOV
      Q(I) = SUMYJ(I) - Q(I)                                               ANOV
      X1(I,1)=Q(I)                                                         ANOV
    7 CONTINUE                                                             ANOV
C                                                                          ANOV
C         STORE 0 IN A(NTOTP1, NTOTP1)                                     ANOV
C                                                                          ANOV
      A(ITOTP1, ITOTP1) = 0.0                                              ANOV
C                                                                          ANOV
C         CALL MATRIX INVERSION SUBROUTINE ON A                            ANOV
C                                                                          ANOV
      CALL MATINV(A, ITOTP1, X1,  0, DET,MAXT1)                            ANOV
C                                                                          ANOV
C         CALCULATE TAU                                                    ANOV
C                                                                          ANOV
      DO 8 I = 1, ITOT                                                     ANOV
      TAUHAT(I) = 0.0                                                      ANOV
      DO 8 J = 1, ITOT                                                     ANOV
    8 TAUHAT(I) = TAUHAT(I) + A(I, J)*Q(J)                                 ANOV
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C                                                                       ANOV
      TAU = 0.0                                                         ANOV
      DO 9 I = 1, ITOT                                                  ANOV
    9 TAU = TAU + TAUHAT(I)* Q(I)                                       ANOV
C                                                                       ANOV
C         CALCULATE SUM OF SQUARES DUE TO MU AND BETA, UNADJUSTED      ANOV
C                                                                       ANOV
      SUMSQX = 0.0                                                      ANOV
      DO 10 J = 1, JTOT                                                 ANOV
   10 SUMSQX = SUMSQX + SUMYI(J) * SUMYI(J) /FLOAT(NSUMI(J))             ANOV
C                                                                       ANOV
C         AND MEAN SQUARE DUE TO TAU                                    ANOV
      MNSQT = TAU/FLOAT(ITOT1)                                          ANOV
C                                                                       ANOV
C         CALCULATE SUM OF SQUARES DUE TO ERROR                         ANOV
      ERROR = SUMSQY - SUMSQX - TAU                                     ANOV
      IF(ERROR.GT.0) GO TO 100                                          ANOV
      WRITE(6,101) ERROR                                                ANOV
  101 FORMAT(@0 ***** ERROR SUM OF SQUARES IS @,G15.6,@ ... PROCESSING AANOV
     2BORTED ***** @)                                                   ANOV
      IWT=-2                                                            ANOV
      RETURN                                                            ANOV
  100 MNSQE=ERROR/FLOAT(IERR)                                           ANOV
C                                                                       ANOV
C         FROM WHICH AN F-RATIO WITH                                    ANOV
C                  (ITOT -1) AND (NSUM - JTOT -ITOT + 1)                ANOV
C         DEGREES OF FREEDOM                                            ANOV
C                                                                       ANOV
      FRATIO = MNSQT / MNSQE                                            ANOV
      PFRAT = FISH(FRATIO,ITOT1,IERR)                                   ANOV
      WRITE(6,2009)IDEN                                                 ANOV
      WRITE (6, 2002)                                                   ANOV
      WRITE(6,2004) NAMEB,JTOT,SUMSQX                                   ANOV
      WRITE(6,2005) NAMET,ITOT1,TAU,MNSQT,FRATIO,PFRAT                  ANOV
      WRITE (6, 2006) IERR, ERROR, MNSQE                                ANOV
      SSS=0.                                                            ANOV
      SST=0.                                                            ANOV
      WT=0.                                                             ANOV
      DO 14 I=1,ITOT                                                    ANOV
      SSR=0.                                                            ANOV
      WW(I)=0.                                                          ANOV
      DO 13 J=1,JTOT                                                    ANOV
      SSR=SSR + V(J)*SUMYIJ(I,J)                                        ANOV
   13 WW(I)=WW(I) + V(J)*V(J)/FLOAT(N(I,J))                             ANOV
      WW(I)=1./WW(I)                                                    ANOV
      WT=WT + WW(I)                                                     ANOV
      SSS=SSS + WW(I)*SSR                                               ANOV
      SST=SST + WW(I)*SSR*SSR                                           ANOV
   14 THAT(I)=SSR-SUMIJ                                                 ANOV
      SST=SST - SSS*SSS/WT                                              ANOV
      MNSST=SST/FLOAT(ITOT1)                                            ANOV
      IF(ITHT.LE.0) GO TO 16                                            ANOV
      FSST=MNSST/WIT                                                    ANOV
      PFSST = FISH(FSST,ITOT1,ITHT)                                     ANOV
   16 WRITE(6,2014) NAMET,ITOT1,SST,MNSST,FSST,PFSST                    ANOV
      TIN=ERROR-WITHT                                                   ANOV
      TINT=TIN/FLOAT(INT)                                               ANOV
      IF(ITHT.LE.0) GO TO 17                                            ANOV
      FINT=TINT/WIT                                                     ANOV
      PFINT = FISH(FINT,INT,ITHT)                                       ANOV
   17 WRITE(6,2012) INT,TIN,TINT,FINT,PFINT
      WRITE(6,2013) ITHT,WITHT,WIT
      WRITE (6, 2003) NSUM, SUMSQY
      WRITE(6,2016) NAMET,(TAUHAT(I),I=1,ITOT)
      WRITE(6,2011) NAMET,(THAT(I),I=1,ITOT)
      WRITE(6,2010) NAMET,DET
C
C     CALCULATE AOV TABLE FOR ADJUSTED BETA EFFECTS
C
      DO 53 IR= 1,JTOT
      DO 53 IS = 1,JTOT
      B(IR,IS) = 0.
      DO 55 J= 1, ITOT
   55 B(IR,IS) = B(IR,IS) + FLOAT(N(J,IR)*N(J,IS)) / FLOAT(NSUMJ(J))
      B(IR,IS) = -B(IR,IS)
      IF(IR.EQ.IS) B(IR,IS) = FLOAT(NSUMI(IR)) + B(IR,IS)
   53 CONTINUE
      DO 52 J= 1,JTOT
      P(J) = 0.
      DO 52 I = 1,ITOT
      P(J) = P(J) + FLOAT(N(I,J)) * SUMYJ(I)/FLOAT(NSUMJ(I))
   52 CONTINUE
      DO 57 J=1,JTOT
      B(JTOTP1,J) = 1.
      B(J,JTOTP1) = 1.
C
C          FINISH CALCULATION OF P
      P(J) = SUMYI(J) - P(J)
      X1(J,1)=P(J)
   57 CONTINUE
      B(JTOTP1,JTOTP1) = 0.
C
C        CALL MATRIX INVERSION SUBROUTINE ON B
C
      CALL MATINV(B,JTOTP1,X1,0,DET,MAXB1)
C
C        CALCULATE BETA
C
      DO 58 I = 1,JTOT
      BETHAT(I) = 0.
      DO 58 J = 1,JTOT
   58 BETHAT(I) = BETHAT(I) + B(I,J)*P(J)
C
      BETA = 0.
      DO 59 J = 1,JTOT
   59 BETA = BETA + BETHAT(J)*P(J)
C
C        CALCULATE SUM OF SQUARES DUE TO MU AND TAU,UNADJUSTED
C
      SUMSQT = 0.
      DO 60 I = 1,ITOT
   60 SUMSQT = SUMSQT + SUMYJ(I) * SUMYJ(I) /FLOAT(NSUMJ(I))
C
C        CALCULATE SUM OF SQUARES DUE TO ERROR
      ERRORB = SUMSQY - SUMSQT - BETA
C
C        AND MEAN SQUARE DUE TO BETA
      MNSQB = BETA/FLOAT(JTOT1)
C
C        AND DUE TO ERROR
```

```
      IF(ERRORB.GT.0.) GO TO 160                                        ANOV
      WRITE(6,101) ERRORB                                               ANOV
      IWT=-3                                                            ANOV
      RETURN                                                            ANOV
  160 MNSQBE=ERRORB/FLOAT(IERR)                                         ANOV
C                                                                       ANOV
C         AND F-RATIO                                                   ANOV
      FRATB = MNSQB  / MNSQBE                                           ANOV
      PFRATB = FISH(FRATB,JTOT1,IERR)                                   ANOV
      WRITE(6,2009)IDEN                                                 ANOV
      WRITE(6,2002)                                                     ANOV
      WRITE(6,2004) NAMET,ITOT,SUMSQT                                   ANOV
      WRITE(6,2005) NAMEB,JTOT1,BETA,MNSQB,FRATB,PFRATB                 ANOV
      WRITE(6,2006) IERR,ERRORB,MNSQBE                                  ANOV
      WT=0.                                                             ANOV
      SSB=0.                                                            ANOV
      SSS=0.                                                            ANOV
      DO 64 J=1,JTOT                                                    ANOV
      SSR=0.                                                            ANOV
      VV(J)=0.                                                          ANOV
      DO 63 I=1,ITOT                                                    ANOV
      SSR=SSR + SUMYIJ(I,J)*W(I)                                        ANOV
   63 VV(J)=VV(J) + W(I)*W(I)/FLOAT(N(I,J))                             ANOV
      VV(J)=1./VV(J)                                                    ANOV
      WT=WT + VV(J)                                                     ANOV
      SSS=SSS + VV(J)*SSR                                               ANOV
      SSB=SSB + VV(J)*SSR*SSR                                           ANOV
   64 BHAT(J)=SSR-SUMIJ                                                 ANOV
      SSB=SSB-SSS*SSS/WT                                                ANOV
      MNSSB=SSB/FLOAT(JTOT1)                                            ANOV
      IF(ITHT.LE.0) GO TO 66                                            ANOV
      FSSB=MNSSB/WIT                                                    ANOV
      PFSSB = FISH(FSSB,JTOT1,ITHT)                                     ANOV
   66 WRITE(6,2014) NAMEB,JTOT1,SSB,MNSSB,FSSB,PFSSB                    ANOV
      BIN=ERRORB-WITHT                                                  ANOV
      BINT=BIN/FLOAT(INT)                                               ANOV
      IF(ITHT.LE.0) GO TO 65                                            ANOV
      FINB=BINT/WIT                                                     ANOV
      PFINB = FISH(FINB,INT,ITHT)                                       ANOV
   65 WRITE(6,2012) INT,BIN,BINT,FINB,PFINB                             ANOV
      WRITE(6,2013) ITHT,WITHT,WIT                                      ANOV
      WRITE(6,2003) NSUM,SUMSQY                                         ANOV
      WRITE(6,2016) NAMEB,(BETHAT(J),J=1,JTOT)                          ANOV
      WRITE(6,2011) NAMEB,(BHAT(J),J=1,JTOT)                            ANOV
      WRITE(6,2010) NAMEB,DET                                           ANOV
      RETURN                                                            ANOV
 2002 FORMAT(@0@,40X,@UNBALANCED TWO-WAY ANALYSIS OF VARIANCE@///       ANOV
     21H , 18X, 2HSV, 19X, 2HDF, 19X, 2HSS, 19X, 2HMS, 20X, 1HF,        ANOV
     317X,@PROB F@)                                                     ANOV
 2003 FORMAT (1H0, 10X, 5HTOTAL, 20X, I5, 15X, G15.7)                   ANOV
 2004 FORMAT(1H0,10X,@MU, @, A8,13X,I5,15X,G15.7/11X,@(UNADJUSTED)@)    ANOV
 2005 FORMAT(1H0,10X, A8,@ (ADJ.)@,10X,I5,15X,3(G15.7,5X),G15.7         ANOV
     2          /11X,@ASSUME ADDITIVE@)                                 ANOV
 2006 FORMAT(1H0,10X,@ERROR@,20X,I5,15X,2(G15.7,5X)/11X,@ADDITIVE@)     ANOV
 2009 FORMAT(1H1 /////////// 30X,8A10)                                  ANOV
 2010 FORMAT (//////,1X,A8,@ EFFECT MATRIX DETERMINANT = @,G15.7)       ANOV
 2011 FORMAT(////10X,@ESTIMATES OF @, A8,@  EFFECTS@/(1X,6G20.7))       ANOV
 2012 FORMAT(1H0,10X,@INTERACTION@,14X,I5,15X,3(G15.7,5X),G15.7)        ANOV
 2013 FORMAT(1H0,10X,@WITHIN CELL ERROR@,8X,I5,15X,2(G15.7,5X))         ANOV
 2014 FORMAT(1H0,10X, A8,@(ADJ.)@,11X,I5,15X,3(G15.7,5X),G15.7          ANOV
     2          /11X,@(WEIGHTED)@)                                      ANOV
 2016 FORMAT(////10X,@ESTIMATES OF @, A8,@  EFFECTS ASSUMING NO INTERACTANOV
     2ION@/(1X,6G20.7))                                                 ANOV
      END                                                               ANOV
      SUBROUTINE MATINV(A,N,B,M,DETERM,MAX)                             MA
      DIMENSION IPIVOT(21), A(MAX, 10), B(10, 1), INDEX(21, 2),         MATV
     2          PIVOT(21)                                               MATV
      EQUIVALENCE (IROW,JROW), (ICOLUM,JCOLUM), (AMAX, T, SWAP)         MATV
C     INITIALIZATION                                                    MATV
   10 DETERM=1.0                                                        MATV
   15 DO 20 J=1,N                                                       MATV
   20 IPIVOT(J)=0                                                       MATV
   30 DO 550 I=1,N                                                      MATV
C     SEARCH FOR PIVOT ELEMENT                                          MATV
   40 AMAX=0.0                                                          MATV
   45 DO 105 J=1,N                                                      MATV
   50 IF (IPIVOT(J)-1) 60, 105, 60                                      MATV
   60 DO 100 K=1,N                                                      MATV
   70 IF (IPIVOT(K)-1) 80, 100, 740                                     MATV
   80 IF(ABS(AMAX)-ABS(A(J,K)))85,100,100                               MATV
   85 IROW=J                                                            MATV
   90 ICOLUM=K                                                          MATV
   95 AMAX=A(J,K)                                                       MATV
  100 CONTINUE                                                          MATV
  105 CONTINUE                                                          MATV
  110 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1                                   MATV
C     INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL                 MATV
  130 IF (IROW-ICOLUM) 140, 260, 140                                    MATV
  140 DETERM=-DETERM                                                    MATV
  150 DO 200 L=1,N                                                      MATV
  160 SWAP=A(IROW,L)                                                    MA
  170 A(IROW,L)=A(ICOLUM,L)                                             MATV
  200 A(ICOLUM,L)=SWAP                                                  MATV
  205 IF(M) 260, 260, 210                                               MATV
  210 DO 250 L=1, M                                                     MATV
  220 SWAP=B(IROW,L)                                                    MATV
  230 B(IROW,L)=B(ICOLUM,L)                                             MATV
  250 B(ICOLUM,L)=SWAP                                                  MATV
  260 INDEX(I,1)=IROW                                                   MATV
  270 INDEX(I,2)=ICOLUM                                                 MATV
  310 PIVOT(I)=A(ICOLUM,ICOLUM)                                         MATV
  320 DETERM=DETERM*PIVOT(I)                                            MATV
C     DIVIDE PIVOT ROW BY PIVOT ELEMENT                                 MATV
  330 A(ICOLUM,ICOLUM)=1.0                                              MATV
  340 DO 350 L=1,N                                                      MATV
  350 A(ICOLUM,L)=A(ICOLUM,L)/PIVOT(I)                                  MATV
  355 IF(M) 380, 380, 360                                               MATV
  360 DO 370 L=1,M                                                      MATV
  370 B(ICOLUM,L)=B(ICOLUM,L)/PIVOT(I)                                  MATV
C     REDUCE NON-PIVOT ROWS                                             MATV
  380 DO 550 L1=1,N                                                     MATV
  390 IF(L1-ICOLUM) 400, 550, 400                                       MATV
  400 T=A(L1,ICOLUM)                                                    MATV
  420 A(L1,ICOLUM)=0.0                                                  MATV
  430 DO 450 L=1,N                                                      MATV
  450 A(L1,L)=A(L1,L)-A(ICOLUM,L)*T                                     MATV
  455 IF(M) 550, 550, 460                                               MA
  460 DO 500 L=1,M                                                      MATV
  500 B(L1,L)=B(L1,L)-B(ICOLUM,L)*T                                     MATV
  550 CONTINUE                                                          MATV
```

```
C      INTERCHANGE COLUMNS                                                    MATV
  600 DO 710 I=1,N                                                            MATV
  610 L=N+1-I                                                                 MATV
  620 IF (INDEX(L,1)-INDEX(L,2)) 630, 710, 630                                MATV
  630 JROW = INDEX(L,1)                                                       MATV
  640 JCOLUM=INDEX(L,2)                                                       MATV
  650 DO 705 K=1,N                                                            MATV
  660 SWAP=A(K,JROW)                                                          MATV
  670 A(K,JROW)=A(K,JCOLUM)                                                   MATV
  700 A(K,JCOLUM)=SWAP                                                        MATV
  705 CONTINUE                                                                MATV
  710 CONTINUE                                                                MATV
  740 RETURN                                                                  MATV
      END                                                                     MATV
      FUNCTION TWOAVT(EMS,JSUB,N2,ALPHA,W,II,IS)                              FUNCTS
      COMMON DUM(357),Y(729),A(4,4),B(4,4)                                    FUNCTS
      TWOAVT=SQRT(EMS*JSUB*FISHIN(ALPHA,JSUB,N2)*(A(II,II)-2.*A(II,IS)        FUNCTS
     2               +A(IS,IS)))                                              FUNCTS
      RETURN                                                                  FUNCTS
      END                                                                     FUNCTS
      FUNCTION TWOAVB(EMS,JSUB,N2,ALPHA,W,II,IS)                              FUNCTS
      COMMON DUM(357),Y(729),A(4,4),B(4,4)                                    FUNCTS
      TWOAVB=SQRT(EMS*JSUB*FISHIN(ALPHA,JSUB,N2)*(B(II,II)-2.*B(II,IS)        FUNCTS
     2               +B(IS,IS)))                                              FUNCTS
      RETURN                                                                  FUNCTS
      END                                                                     FUNCTS
      FUNCTION TWOWT (EMS,JSUB,N2,ALPHA,W,II,IS)                              FUNCTS
      DIMENSION W(1)                                                          FUNCTS
      TWOWT=SQRT(EMS*JSUB*FISHIN(ALPHA,JSUB,N2)*(1./W(II) + 1./W(IS)))        FUNCTS
      RETURN                                                                  FUNCTS
      END                                                                     FUNCTS
      SUBROUTINE SCHEFE(K,TMEANS,EMS,N2,ALPHA,KOE,W,FDUM)                     SCHEFE
C                                                                             SCHEFE
C     SCHEFFE@S CONTRASTS FOR SIGNIFICANT DIFFERENCES IN MEANS                SCHEFE
C                                                                             SCHEFE
C  K=NUMBER OF MEANS TO BE TESTED   TMEANS=VECTOR OF MEANS TO BE TESTED       SCHEFE
C  EMS=ERROR MEAN SQUARE (DENOMINATOR OF F TEST)                              SCHEFE
C  N2 =ERROR DEGREES OF FREEDOM                                               SCHEFE
C     FDUM IS A DUMMY EXTERNALLY DEFINED FUNCTION TO CALCULATE CONTRAST       SCHEFE
C FOR STANDARD OUTPUT (K.LE.10) ALL MEANS HAVING THE SAME LINE UNDER THESCHEFE
C     STATISTACALLY THE SAME.                                                 SCHEFE
      DIMENSION TMEANS(K),PRINT(20),KOE(1),W(1)                               SCHEFE
      DATA BLANK /6H      /,XLINE / 6HXXXXXX /                                SCHEFE
      ISAVE2=0                                                                SCHEFE
C RANK MEANS FROM LOW TO HIGH                                                 SCHEFE
      CALL ORDERM(TMEANS,K,KOE)                                               SCHEFE
      WRITE(6,51) (KOE(I),I=1,K)                                              SCHEFE
   51 FORMAT(@ @,10(6X,I2,4X))                                                SCHEFE
      WRITE(6,53)(TMEANS(I),I=1,K)                                            SCHEFE
 53   FORMAT(1X ,10G12.6)                                                     SCHEFE
C DO COMPARISONS                                                              SCHEFE
      ISTOP=K                                                                 SCHEFE
 25   ISM1=ISTOP-1                                                            SCHEFE
      DO 24 I=1,20                                                            SCHEFE
 24   PRINT(I)=BLANK                                                          SCHEFE
      DO 30 I=1,ISM1                                                          SCHEFE
      ISAVE=I                                                                 SCHEFE
      JSUB=ISM1-I+1                                                           SCHEFE
 29   IF(ISAVE2.EQ.I    )GO TO 31                                             SCHEFE
      RANGE = TMEANS(ISTOP)-TMEANS(I)                                         SCHEFE
      II=KOE(I)                                                         SCHEFE
      IS=KOE(ISTOP)                                                     SCHEFE
      S=FDUM(EMS,JSUB,N2,ALPHA,W,II,IS)                                 SCHEFE
      IF(RANGE-S) 34,34,30                                              SCHEFE
 30   CONTINUE                                                          SCHEFE
 31   ISTOP=ISTOP-1                                                     SCHEFE
      IF(ISTOP.EQ.1)GO TO 99                                            SCHEFE
      GO TO 25                                                          SCHEFE
 34   IF(K.LE.10)GO TO 35                                               SCHEFE
      WRITE(6,33)ALPHA,(TMEANS(KKK),KKK=ISAVE,ISTOP)                    SCHEFE
 33   FORMAT( @0 THE FOLLOWING MEANS ARE STATISTICALLY THE SAME AT THE @SCHEFE
     2      ,F5.3,@ ALPHA LEVEL@,/,(10G12.6))                           SCHEFE
      GO TO 38                                                          SCHEFE
 35   DO 37 I=ISAVE,ISTOP                                               SCHEFE
      II=2*I                                                            SCHEFE
      PRINT(II-1) = XLINE                                               SCHEFE
   37 PRINT(II) = XLINE                                                 SCHEFE
      WRITE(6,52)(PRINT(KK),KK=1,20)                                    SCHEFE
 38   IF(ISAVE.EQ.1)GO TO 99                                            SCHEFE
      ISAVE2=ISAVE                                                      SCHEFE
      GO TO 31                                                          SCHEFE
 99   RETURN                                                            SCHEFE
 52   FORMAT(@ @,20A6)                                                  SCHEFE
      END                                                               SCHEFE
       SUBROUTINE ORDERM(X,N,KOE)                                       ORDER
       DIMENSION X(N)   ,KOE(N)                                         ORDER
      NN=N                                                              ORDER
       K1=2                                                             ORDER
      DO 80 I=1,NN                                                      ORDER
   80 KOE(I)=I                                                          ORDER
    4  DO 99 I=K1,NN                                                    ORDER
       IF(X(I).LT.X(I-1)) GOTO 76                                       ORDER
   99 CONTINUE                                                          ORDER
      RETURN                                                            ORDER
   76  DO 82 K= 1,NN                                                    ORDER
      IF(X(I).LT.X(K)) GO TO 84                                         ORDER
   82 CONTINUE                                                          ORDER
   84 Z=X(I)                                                            ORDER
      KK=KOE(I)                                                         ORDER
      I1=I-1                                                            ORDER
      DO 86KJ=K,I1                                                      ORDER
      J=K+I1-KJ                                                         ORDER
      KOE(J+1)=KOE(J)                                                   ORDER
   86 X(J+1)=X(J)                                                       ORDER
      X(K)=Z                                                            ORDER
      KOE(K)=KK                                                         ORDER
      K1=I+1                                                            ORDER
       IF(K1.GT.NN) RETURN                                              ORDER
       GOTO 4                                                           ORDER
       END                                                              ORDER
       FUNCTION FISHIN(ALPHA,N1,N2)                                     FISHIN
C-----------------------------------------------------------------------FISHIN
C CALCULATES THE INVERSE @F@ VALUE GIVEN THE CONFIDENCE COEFFICIENT     FISHIN
C   ALPHA AND THE DEGREES OF FREEDOM(N).                                FISHIN
C-----------------------------------------------------------------------FISHIN
      Y1=N1                                                             FISHIN
      Y2=N2                                                             FISHIN
C-----------------------------------------------------------------------FISHIN
C  ADJUST FOR DEGREES OF FREEDOM EQUAL TO 1                             FISHIN
C-----------------------------------------------------------------------FISHIN
```

```
      IF(N1.EQ.1)  Y1=2                                                 FISHIN
      IF(N2.EQ.1)  Y2=2                                                 FISHIN
C-----------------------------------------------------------------------FISHIN
C CALL PHINV TO GET INVERSE NORMAL VALUE OF 1.-ALPHA                    FISHIN
C-----------------------------------------------------------------------FISHIN
       X=PHINV(1.-ALPHA)                                                FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE LAMDA VALUE                                                  FISHIN
C-----------------------------------------------------------------------FISHIN
      Y=(X**2-3.)/6.                                                    FISHIN
      IC=0                                                              FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE THE INITIAL APPROXIMATION TO THE INVERSE @F@ FUNCTION        FISHIN
C-----------------------------------------------------------------------FISHIN
      Y1=1./(Y1-1.)                                                     FISHIN
      Y2=1./(Y2-1.)                                                     FISHIN
      H=2./(Y1+Y2)                                                      FISHIN
      X=X*SQRT(H+Y)/H-(Y1-Y2)*(Y+5./6.-2./(3.*H))                       FISHIN
      X=EXP(2.*X)                                                       FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE THE CONSTANT TO THE @F@ DISTRIBUTION,TESTING FOR N1 AND/OR N2FISHIN
C   ODD OR EVEN.                                                        FISHIN
C-----------------------------------------------------------------------FISHIN
      G=1.                                                              FISHIN
      IB1=2                                                             FISHIN
      IF(MOD(N1,2).EQ.0) GO TO 1                                        FISHIN
      G=1.7724539                                                       FISHIN
      IB1=1                                                             FISHIN
    1 IB2=2                                                             FISHIN
      IF(MOD(N2,2).EQ.0) GO TO 2                                        FISHIN
      G=G*1.7724539                                                     FISHIN
      IB2=1                                                             FISHIN
    2 IB3=2                                                             FISHIN
      IF(MOD(N1+N2,2).EQ.0) GO TO 3                                     FISHIN
      G=G/1.7724539                                                     FISHIN
      IB3=1                                                             FISHIN
    3 IF((IB1+IB2).NE.2)  G=2.*G                                        FISHIN
      IF((N1+N2).LE.3)  GO TO 5                                         FISHIN
      ND=N1+N2-2-IB3                                                    FISHIN
      ND1 = ND + 1                                                      FISHIN
      DO 4 II=1,ND1,2                                                   FISHIN
      I = II - 1                                                        FISHIN
      IF((IB1+I).LE.(N1-2))  G=G*(IB1+I)                                FISHIN
      IF((IB2+I).LE.(N2-2))  G=G*(IB2+I)                                FISHIN
    4 G=G/(IB3+I)                                                       FISHIN
C-----------------------------------------------------------------------FISHIN
C  COMPUTE THE VALUE OF FISHIN                                          FISHIN
C-----------------------------------------------------------------------FISHIN
    5 Y2=N2/(N2+N1*X)                                                   FISHIN
      Y1=1.-Y2                                                          FISHIN
      Y=1.+(G*(1.-ALPHA-FISH(X,N1,N2)))/SQRT(Y1**N1*Y2**N2)             FISHIN
      FISHIN=X*Y                                                        FISHIN
C-----------------------------------------------------------------------FISHIN
C  IF FISHIN IS NEGATIVE, RESET FISHIN TO .5*LAST APPROXIMATION(X).     FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(Y.LT.0.)  FISHIN=.5*X                                          FISHIN
C-----------------------------------------------------------------------FISHIN
C  IF THE ABSOLUTE VALUE OF THE DIFFERENCE IS LESS THAN .5E-6, RETURN   FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(ABS(X/FISHIN-1.).LT.(.5E-6))  GO TO 7                          FISHIN
```

```
C-----------------------------------------------------------------------FISHIN
C  IF THE RELATIVE VALUE OF THE DIFFERENCE IS LESS THAN .5E-6, RETURN   FISHIN
C-----------------------------------------------------------------------FISHIN
      IF(ABS(X-FISHIN).LT.(.5E-6)) GO TO 7                              FISHIN
      IC=IC+1                                                           FISHIN
      IF(IC.GT.100)  RETURN                                             FISHIN
C-----------------------------------------------------------------------FISHIN
C  SET THE APPROXIMATION EQUAL TO FISHIN AND CONTINUE TO ITERATE.       FISHIN
C-----------------------------------------------------------------------FISHIN
      X=FISHIN                                                          FISHIN
      GO TO 5                                                           FISHIN
    7 RETURN                                                            FISHIN
      END                                                               FISHIN
      FUNCTION PHINV( P )                                               PHINV
      IF(P .EQ. 1.0)GO TO 98                                            PHINV
      IF(P .EQ. 0.0)GO TO 97                                            PHINV
      IF(P .GT. 1.0)GO TO 88                                            PHINV
      IF(P .LT. 0.0)GO TO 88                                            PHINV
      K = 1                                                             PHINV
      IF(P .GT. 0.5)GO TO 47                                            PHINV
    6 T3=SQRT(-2.0*ALOG(P))                                             PHINV
      T4P=2.515517+.802853*T3+.010328*T3*T3                             PHINV
      T5P=1.0+1.432788*T3+.189269*T3*T3+.001308*T3*T3*T3                PHINV
      XT=T3-T4P/T5P                                                     PHINV
      XT=-XT                                                            PHINV
   13 DO 53 I=1,100                                                     PHINV
      PHP = EXP(-0.5*XT*XT)                                             PHINV
      PT = PHI (XT)                                                     PHINV
      IF(ABS(P-PT) .LT. P*4.0E-8)GO TO 99                               PHINV
      Z = (P-PT)*2.50662827 / PHP                                       PHINV
      XT = XT + Z                                                       PHINV
   53 CONTINUE                                                          PHINV
      GO TO 99                                                          PHINV
   47  P = 1.0 - P                                                      PHINV
      K = 2                                                             PHINV
      GO TO 6                                                           PHINV
   99 GO TO (26,27),K                                                   PHINV
   26 PHINV = XT                                                        PHINV
      RETURN                                                            PHINV
   27 PHINV = -XT                                                       PHINV
      P = 1.0 - P                                                       PHINV
      RETURN                                                            PHINV
   98 PHINV = 1.0E+38                                                   PHINV
      RETURN                                                            PHINV
   97 PHINV = -1.0E+38                                                  PHINV
      RETURN                                                            PHINV
   88 WRITE(6,10) P                                                     PHINV
   10 FORMAT(1H0,5X,29HARGUMENT NOT A PROBABILITY = ,5X,E14.7   )       PHINV
      RETURN                                                            PHINV
      END                                                               PHINV
```

D.7 Control cards and modification deck for modifying retrieval program to perform analysis of covariance

```
NASARET,CM20000,T1000.        NEWTON
ACCOUNT,AN12318,.
RFL,70000.
GET,RTREVE.
GET(ANACSRC)
MODIFY,F,P=RTREVE,LO=CET.
FTN,I,L=0,PL=50000,T.
ATTACH,FTNIMSL/UN=LB12345.
GET,FTNPLT/UN=AN12005.
GET,RA1.
GET,RA2.
GET,RA3.
GET,RA4.
RFL,110000.
MODE(1)
LOAD,LGO,FTNIMSL,FTNPLT.
EXECUTE.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
EXIT.
PACK,ZZZZZEF.
COPYSBF,ZZZZZEF,OUTPUT.
-
*CREATE  ANACSRC
*IDENT  APR24
*DECK  STAT
*D  75
      IVV(1)=IVV(2)=IVV(3)=0
*D  108
      IF(IFIRST-ILAST)162,163,166
  163 PRINT 401
  401 FORMAT(*  SINGLE VALUE NOT ANALYZED*)
*DECK  MESIG
*D  6
      IF(NFIRST-NLAST) 10,10,90
*IDENT  SETWRK
*DECK  KRUSWAL
*D  1
      SUBROUTINE KRUSWAL(XIN,ID1,ID2IN,N,NCEN,JOP,K,NU,NC,IP2)
*D  22
      DIMENSION XIN(1),ID1(1),ID2IN(1),NU(6),NC(6),XY(120),ID2(120)
*I  28
C     MOVE INCOMMING ARRAYS TO WORK ARRAYS
      DO 10 I=1,N
      XY(I)=XIN(I)
      ID2(I)=ID2IN(I)
   10 CONTINUE
*IDENT  FIX
*DECK RETD
*D  1
      PROGRAM RETD(INPUT,OUTPUT,TAPE6=OUTPUT)
*DECK  STAT
*MODNAME  DEC10
*D  8,19
*D  23
*D  25
*D  26
      IF(ICASE.EQ.2) GO TO 998
*MODNAME STAT
*I 190
```

```
      IF(ICASE.EQ.4) 710,711
  710 IF(NNN(2).EQ.1) GO TO 712
      GO TO 713
  712 NNN1=NNN(1)+1
      NSLTM1=J-1
      DO 179 I=NNN1,NSLTM1
  179 X(I)=X(I+1)
  713 NNN(2)=NNN(3)
      NNN(3)=0
  711 CONTINUE
*I   219
      P(3)=0
*D   222,223
      PRINT 3600,IP2(1),FVAL,PRFVAL
 3600 FORMAT(1H0,A8,F8.3,23H IS SIGNIFICANT AT THE    ,F5.1,
*D   230
      PRINT 3600,IP2(2),FVAL,PRFVAL
*D   235
      PRINT 3600,IP2(3),FVAL,PRFVAL
*D   262
      L=NNN(1)+NNN(2)+J
*I 265
      NP=NNN(1)+NNN(3)
      NNN(2)=NNN(3)
*I   267
  993 CONTINUE
*IDENT FIX2
*DECK  STAT
    155
      NN=NN-NNN(2)
*I   165
      NN=NN-NNN(3)
*D   247
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,NT,NNN,LK,LK)
*D   252
      IPI=2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)
*D   257
      IPI=3
      CALL KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,1,2,NNN(2),LK,IPI)
*D   267
      IPI=3
      IF(ICASE.EQ.4) IPI=2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)
*DECK  KRUSWAL
*D 113
      CALL TWOSPL(R1,ID2,N,NU,NC,IP2)
*DECK  TWOSPL
*D   1
      SUBROUTINE TWOSPL(R1,ID2,N,NU,NC,IP2)
*D   8
      IF(ID2(I).EQ.IP2) GO TO 26
*IDENT  XREDUC
 ECK RETD
 ODNAME   REDUCE
*D   1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D   2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*DECK  RET
```

```
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*D  3
      IF(IH.LE.151)  GO TO 10
*D  4
      IF(NSMP.LE.150)  GO TO 35
*DECK  SETCR1
*MODNAME  REDUCE
*D  1
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*DECK  RETRVE
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*D  3
      IF(N.GT.150)  GO TO 110
*DECK  STAT
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*DECK  OTEST
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*DECK  STPLOT
*MODNAME  REDUCE
*D  1
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP
*D  2
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)
*IDENT  ANAC1
*DECK STAT
*I  6
      COMMON CHEM(200),TIME(200),NOB(3),TREAT(6),SL(6),SS(12),XMSC(12)
     2      ,F(12),PROBF(12),XM(6),YM(6),NDFC(12),SXX(6),SYY(6),SXY(6)
      COMMON ZCH(2,60),WORK(2,60)
      DIMENSION C(28)
*D  186,187
      GO TO 321
*I  188
  321 XOUT(J)=MDATE(I)
*I  190
C     SET FLAG FOR ANACOVA
      IF(LMAN(1).EQ.1) IANC=1
      IF(ICASE.EQ.2.OR.ICASE.EQ.3) GO TO 322
      PRINT 605
  605 FORMAT(*  MISSING INFLIGHT DATA - NO ANACOVA POSSIBLE*)
      IANC=0
      GO TO 716
C     PICK INFLIGHT DATA ONLY INTO CHEM AND TIME
C     X IS CHANGED HERE AND LATER
  322 IF(LMAN(1).EQ.1) LOBS=0
      I=NUM(1)+1
      J=NNN(1)+NNN(2)
      DO 714 K=I,J
      LOBS=LOBS+1
      CHEM(LOBS)=X(K)
      TIME(LOBS)=XOUT(K)
  714 CONTINUE
      NOB(LMAN(1))=NNN(2)
  716 CONTINUE
*MODNAME  FIX
*I  20
      IF(LMAN(1).LT.3.OR.IANC.NE.1) GO TO 999
      PRINT 1000,JOB(3)
      PRINT 604,LSTUDY(1),KSTUDY,IWORD,LTEST(1),KTEST,LTYPE(1)
  604 FORMAT(7HOSTUDY ,I2,2X,A8,2X,A10,2X,5HTEST  ,I3,2X,A8,2X,5HTYPE ,
     2I3,*  INFLIGHT DATA FOR ANACOVA*)
      PRINT 602
      K=0
      DO 715 L=1,3
      J=K+1
      K=K+NOB(L)
      PRINT 602
  602 FORMAT(1H )
      M=0
      DO 717 I=J,K
      M=M+1
  717 PRINT 601,M,CHEM(I),TIME(I)
  715 CONTINUE
  601 FORMAT(I4,F12.4,F5.0)
      NT=3
      IOPT=2
      CALL ANACOVA(CHEM,TIME,LOBS,NT,NOB,TREAT,SL,SS,XMSC,F,PROBF,
     2     IOPT,XM,YM,SXX,SYY,SXY,NDFC)
      IF(IOPT.LT.0) PRINT 603
  603 FORMAT(@  ANACOVA  ERROR************@)
      J=1
      K=0
      DO 719 LAS=1,3
      K=K+NOB(LAS)
      L=0
      DO 718 I=J,K
      L=L+1
      ZCH(2,L) =0.
      ZCH(1,L)=CHEM(I)-(YM(LAS)+SL(LAS)*(TIME(I)-XM(LAS)))
      CHEM(I)=ZCH(1,L)
      WORK(1,L)=0.
      WORK(2,L)=0.
  718 CONTINUE
      CALL LAGCOR(NOB(LAS),CHEM(J),NOB(LAS),CHEM(J),C,1,28)
      PRINT 610,LAS
  610 FORMAT(*0 MAN*,I3,*  LAG CORRELATIONS*/*0SEQ    C-VALUE*)
      PRINT 611,(I,C(I),I=1,28)
  611 FORMAT(I6,G15.6)
      N=NOB(LAS)
      CALL FOURG(ZCH,N,-1,WORK)
      DO 723 I=1,N
      WORK(1,I)=ZCH(1,I)**2+ZCH(2,I)**2
  723 WORK(2,I)=ATAN2(ZCH(2,I),ZCH(1,I))
      PRINT 602
      PRINT 607
  607 FORMAT(1H0,T16,*FAST FOURIER TRANSFORMS*/* SEQ OMEGA*,
     1         6X,@REAL            IMAGINARY         R**2+I**2       ARCTAN(I/R)@)
      DO 720 M=1,N
      GNM=FLOAT(N)/FLOAT(M-1)
      IF(M.EQ.1) GNM=0.
      PRINT 606,M,GNM,ZCH(1,M),ZCH(2,M),WORK(1,M),WORK(2,M)
  720 CONTINUE
  606 FORMAT(1X,I3,F6.2,4G15.6)
      J=K+1
  719 CONTINUE
-
JOB  DATE    400
STUDYEACH      3
DATE RANGE   189   209
DATE RANGE   220   265
TYPE EACH      1
TEST RANGE   406   409
END
EOF
-
-
```

D.8 Analysis of covariance program as contained in file ANACSRC

```
NASA,CM50000,     L NEWTON
ACCOUNT,AN12318.
COPY(INPUT,ANACSRC)
REPLACE(ANACSRC)
-
ANACOVA
      SUBROUTINE ANACOVA(Y,X,L ,NT,NOB,TREAT,SL,SS,XMS,F,PROBF,IOPT,
     Z              XM,YM,SXX,SYY,SXY,NDF)
      DIMENSION Y(2),X(2),NOB(2),YM(2),XM(2),SL(2),SS(2),XMS(2),F(2),
     2          PROBF(2),SXX(2),SYY(2),SXY(2),TREAT(2),NDF(2)
      SS(1)=0
      SS(9)=0
      NTT=NT+1
      NT2=NT+2
      NT3=NT+3
      SS(12)=0
      L=0
      DO 9 I=1,NT3
      SXX(I)=0
      SYY(I)=0
      SXY(I)=0
      XM(I)=0
      YM(I)=0
    9 CONTINUE
      DO 20 I=1,NT
      IF(NOB(I).EQ.0) GO TO 99
      NO=NOB(I)
      DO 10 J=1,NO
      L=L+1
      XM(I)=XM(I)+X(L)
      YM(I)=YM(I)+Y(L)
      SXX(I)=SXX(I)+X(L)*X(L)
      SYY(I)=SYY(I)+Y(L)*Y(L)
   10 SXY(I)=SXY(I)+X(L)*Y(L)
      YM(NTT)=YM(NTT)+YM(I)
      XM(NTT)=XM(NTT)+XM(I)
      SXX(NTT)=SXX(NTT)+SXX(I)
      SXY(NTT)=SXY(NTT)+SXY(I)
      SYY(NTT)=SYY(NTT)+SYY(I)
      SS(12)=SS(12)+SYY(I)
      XM(I)=XM(I)/NO
      YM(I)=YM(I)/NO
      SXX(I)= SXX(I)-NO*XM(I)**2
      SYY(I)=(SYY(I)-NO*YM(I)**2)/(NO-1.)
      SXY(I)= SXY(I)-NO*XM(I)*YM(I)
      SL(I)=SXY(I)/SXX(I)
      TREAT(I)= YM(I)-SL(I)*XM(I)
      SS(1)=SS(1)+NO*YM(I)*YM(I)
      SS(9)=SS(9)+SXX(I)*SL(I)**2
      SXY(NT3)=SXY(NT3)+NO*XM(I)*YM(I)
      SXX(NT3)=SXX(NT3)+NO*XM(I)**2
      SXX(NT2)=SXX(NT2)+SXX(I)
      SXY(NT2)=SXY(NT2)+SXY(I)
      SXX(I)=SXX(I)/(NO-1.)
      SXY(I)=SXY(I)/(NO-1.)
   20 CONTINUE
      YM(NTT)=YM(NTT)/L
      XM(NTT)=XM(NTT)/L
      SXX(NTT)=(SXX(NTT)-L*XM(NTT)*XM(NTT))/(L-1.)
      SXY(NTT)=(SXY(NTT)-L*XM(NTT)*YM(NTT))/(L-1.)
      SSU=L*YM(NTT)*YM(NTT)
      SYY(NTT)=(SYY(NTT)-SSU)/(L-1.)
      SL(NTT)=SXY(NTT)/SXX(NTT)
      SS(NTT)=SS(12)
      SL(NT2)=SXY(NT2)/SXX(NT2)
      SS(6)=SXX(NT2)*SL(NT2)**2
      SXX(NT2)=SXX(NT2)/(L-NT)
      SXY(NT2)=SXY(NT2)/(L-NT)
      SS(8)=SS(9)-SS(6)
      SXX(NT3)= (SXX(NT3) - L*XM(NTT)**2) /(NT-1.)
      SXY(NT3)= (SXY(NT3) - L*XM(NTT)*YM(NTT))/(NT-1.)
      IF(SXX(NT3).GT.0) GO TO 50
      SL(NT3)=1.0E28
      TREAT(NT3)=YM(NTT)
      SS(4)=0.
      SS(3)=0.
      GO TO 51
   50 CONTINUE
      SL(NT3)= SXY(NT3)/SXX(NT3)
      SS(4)= (NT-1.)*SXX(NT3)*SL(NT3)**2
      SS(3)= (SL(NTT)-SL(NT3))**2/(1./(SXX(NT3)*(NT-1.))
     2                            + 1./(SXX(NT2)*(L-NT)))
      TREAT(NT3)=YM(NTT)-SL(NT3)*XM(NTT)
   51 CONTINUE
      SS(1)=SS(1)-SSU
      SS(5)= SS(1)-SS(4)
      SS(2)= (L-1.)*SXX(NTT)*SL(NTT)**2
      SS(10)=SSU+SS(1)+SS(9)
      SS(7) =SSU+SS(1)+SS(6)
      TREAT(NTT)=YM(NTT)-SL(NTT)*XM(NTT)
      SS(11)=SS(12)-SS(10)
      TREAT(NT2)=0
      NDF(1)=NT-1
      NDF(2)= 1
      NDF(3)= 1
      NDF(4)= 1
      NDF(5)= NT-2
      NDF(6)= 1
      NDF(7)= NT+1
      NDF(8)= NT-1
      NDF(9)= NT
      NDF(10)=2*NT
      NDF(12)=L
      NDF(11)=L-NDF(10)
      DO 55 K=1,11
      IF(NDF(K).GT.0) GO TO 54
      XMS(K)=0
      GO TO 55
   54 XMS(K)=SS(K)/NDF(K)
   55 CONTINUE
      DO 60 K=1,10
      F(K)=XMS(K)/XMS(11)
      IF(F(K).GT.0.) GO TO 59
      PROBF(K)=0.
      GO TO 60
   59 PROBF(K)=FISH(F(K),NDF(K),NDF(7))
   60 CONTINUE
      IF(IOPT.LT.1) GO TO 999
      WRITE(6,150)
      WRITE(6,1)
```

```
  1 FORMAT(@0 TREAT@,T10,@NUM@,T18,@INDEPENDENT@,T34,@INDEPENDENT@,
   2       T50,@DEPENDENT@,T67,@DEPENDENT@,T83,@COVARIANCE@,
   3       T99,@INTERCEPT@,T118,@SLOPE@/2X,@MENT@,T10,@BER@,
   4       T20,@MEAN@,T35,@VARIANCE@,T51,@MEAN@,T67,@VARIANCE@//)
    DO 70 I=1,NT
    WRITE(6,2) I,NOB(I),Xm(I),SXX(I),YM(I),SYY(I),SXY(I),TREAT(I),
   2           SL(I)
 70 CONTINUE
  2 FORMAT(2X,I5,1X,I5,7(4X,G13.6))
    WRITE(6,4) SXX(NT2),SXY(NT2),SL(NT2)
  4 FORMAT(1X,124(1H-)/2X,@1SLOPE@,26X,G13.6,38X,G13.6,21X,G13.6)
    WRITE(6,5) SXX(NT3),SXY(NT3),SL(NT3)
  5 FORMAT(/2X,@SLOPE @,26X,G13.6,38X,G13.6,21X,G13.6/2X,@OF MEANS@)
    WRITE(6,3)     L     ,XM(NTT),SXX(NTT),YM(NTT),SYY(NTT),SXY(NTT),
   Z               TREAT(NTT),SL(NTT)
  3 FORMAT(/2X,@TOTAL@,1X,I5,7(4X,G13.6))
    WRITE(6,150)
    IF(IOPT.EQ.3) GO TO 80
    WRITE(6,100) SSU,(NDF(I),SS(I),XMS(I),F(I),PROBF(1),I=1, 5)
100 FORMAT(//,15X,93(1H-),/,47X,@ANALYSIS OF COVARIANCE TABLE@,/,15X
   193(1H-),/,15X,@SOURCE OF@,9X,@DEGREES OF@,5X,@SUM OF@,10X,@MEAN@
   212X,@F-@,14X,@PROB@,/,15X,@VARIATION@,9X,@FREEDOM@,8X,@SQUARES@,
   39X,@SQUARE@,10X,@RATIO@,11X,@F@,/,15X,93(1H-),/,15X,@MEAN@,19X,
   *@1@,8X,G13.6,/,15X,@TREATMENTS@,4X,I10,8X,4(G13.6,3X),/,15X,
   493(1H-),/,
   A             15X,@1 POPULATION @,1X,I10,8X,4(G13.6,3X)
   B          ,/,15X,@1 POP.- SLOPE@,1X,I10,8X,4(G13.6,3X)
   C          ,/,15X,@    OF MEANS @,/,15X ,
   * 93(1H-),/,15X,@SLOPE OF MEANS@,I10,8X,4(G13.6,3X)
   D          ,/,15X,@DIFF MEAN SL,@,1X,I10,8X,4(G13.6,3X)
   E          ,/,15X,@AND  PAR. SL.@
   F          )
    WRITE(6,102)      (NDF(I),SS(I),XMS(I),F(I),PROBF(I),I=6,10),
   2              NDF(11),SS(11),XMS(11),NDF(12),SS(12)
102 FORMAT(
   F          ,/,15X,@PARALLEL LINE@,1X,I10,8X,4(G13.6,3X)
   G          ,/,15X,@   SLOPE      @,/, 15X,
   H 93(1H-),/,15X,@PARALLEL LINE@,1X,I10,8X,4(G13.6,3X)
   I          ,/,15X,@   MODEL      @,/,  15X,
   J 93(1H-),/,15X,@NON-          @,1X,I10,8X,4(G13.6,3X)
   K          ,/,15X,@  PARALLELISM@,
   L          ,/,15X,@INDIVIDUAL   @,1X,I10,8X,4(G13.6,3X)
   M          ,/,15X,@  SLOPES     @,/, 15X,
   N 93(1H-),/,15X,@REGRESSION   @,1X,I10,8X,4(G13.6,3X)
   O          ,/,15X,@  MODEL      @
   P          ,/,15X,@ERROR        @,1X,I10,8X,2(G13.6,3X),/,
   * 15X,
   Q 93(1H-),/,15X,@TOTAL        @,1X,I10,8X,  G13.6,/,
   * 15X,
   R 93(1H-))
    WRITE(6,150)
    IF(IOPT.EQ.1) RETURN
 80 NUF(7)=NDF(7)-1
    NDF(10)=NDF(10)-1
    NDF(12)=NDF(12)-1
    SS(7)=SS(7)-SSU
    SS(10)=SS(10)-SSU
    SS(12)=SS(12)-SSU
    XMS(7)=XMS(7)/NDF(7)
    XMS(10)=XMS(10)/NDF(10)
```

```
      F(7)=XMS(7)/XMS(11)
      F(10)=XMS(10)/XMS(11)
      PROBF(7)=FISH(F(7),NDF(7),NDF(11))
      PROBF(10)=FISH(F(10),NDF(10),NDF(11))
      WRITE(6,101)      (NDF(I),SS(I),XMS(I),F(I),PROBF(I),I=1, 5)
  101 FORMAT(//,15X,93(1H-),/,38X,@ANALYSIS OF COVARIANCE TABLE (MEAN DI
     AFFERENCE)@,/,15X,
     193(1H-),/,15X,@SOURCE OF@,9X,@DEGREES OF@,5X,@SUM OF@,10X,@MEAN@,
     212X,@F-@,14X,@PROB@,/,15X,@VARIATION@,9X,@FREEDOM@,8X,@SQUARES@,
     39X,@SQUARE@,10X,@RATIO@,11X,@F@,/,15X,93(1H-),/,
     *                 15X,@TREATMENTS@,4X,I10,8X,4(G13.6,3X),/,15X,
     493(1H-),/,
     A               15X,@1 POPULATION @,1X,I10,8X,4(G13.6,3X)
     B          ,/,15X,@1 POP.- SLOPE@,1X,I10,8X,4(G13.6,3X)
     C          ,/,15X,@     OF MEANS @,/,    15X,
     * 93(1H-),/,15X,@SLOPE OF MEANS@,I10,8X,4(G13.6,3X)
     D          ,/,15X,@DIFF MEAN SL.@,1X,I10,8X,4(G13.6,3X)
     E          ,/,15X,@AND  PAR. SL.@
     F          )
      WRITE(6,102)      (NDF(I),SS(I),XMS(I),F(I),PROBF(I),I=6,10),
     2                 NDF(11),SS(11),XMS(11),NDF(12),SS(12)
      WRITE(6,150)
  150 FORMAT(1H1)
  999 RETURN
   99 IOPT=-1
      RETURN
      END
-
FOURG
      SUBROUTINE FOURG (DATA,N,ISIGN,WORK)                              FFG
C     COOLEY-TUKEY FAST FOURIER TRANSFORM IN USASI BASIC FORTRAN.       FFG
C     ONE-DIMENSIONAL TRANSFORM OF COMPLEX DATA, ARBITRARY NUMBER OF    FFG
C     POINTS.  N POINTS CAN BE TRANSFORMED IN TIME PROPORTIONAL TO      FFG
C     N*LOG(N) (FOR N NON-PRIME), WHEREAS OTHER METHODS TAKE N**2 TIME. FFG
C     FURTHERMORE, BECAUSE FEWER ARITHMETIC OPERATIONS ARE PERFORMED,   FFG
C     LESS ERROR IS BUILT UP.  THE TRANSFORM DONE IS--                  FFG
C     DIMENSION DATA(N),TRANSFORM(N),WORK(N)                            FFG
C     COMPLEX DATA,TRANSFORM,WORK                                       FFG
C     TRANSFORM(K) = SUM(DATA(J)*EXP(ISIGN*2*PI*I*(J-1)*(K-1)/N)),      FFG
C     SUMMED FROM J = 1 TO N FOR ALL K FROM 1 TO N.  THE TRANSFORM      FFG
C     VALUES ARE RETURNED TO DATA, REPLACING THE INPUT.  N MAY BE ANY   FFG
C     POSITIVE NUMBER, BUT IT SHOULD BE NON-PRIME FOR SPEED.  ISIGN =   FFG
C     +1 OR -1.  A -1 TRANSFORM FOLLOWED BY A +1 ONE (OR VICE VERSA)    FFG
C     RETURNS N TIMES THE ORIGINAL DATA.  WORK IS A ONE-DIMENSIONAL     FFG
C     COMPLEX ARRAY OF LENGTH N USED FOR WORKING STORAGE.               FFG
C     RUNNING TIME IS PROPORTIONAL TO N * (SUM OF THE PRIME FACTORS OF  FFG
C     N).  FOR EXAMPLE, N = 1960, TIME IS T0 * 1960 * (2+2+2+5+7+7).    FFG
C     NAIVE METHODS DIRECTLY IMPLEMENTING THE SUMMATION RUN IN TIME     FFG
C     PROPORTIONAL TO N**2.  AN UPPER BOUND FOR THE RMS RELATIVE ERROR  FFG
C     IS 3 * 2**(-B) * SUM(F**1.5), WHERE B IS THE NUMBER OF BITS IN    FFG
C     THE FLOATING POINT FRACTION AND THE SUM IS OVER THE PRIME         FFG
C     FACTORS OF N.  WRITTEN BY NORMAN BRENNER, MIT LINCOLN LABORATORY, FFG
C     AUGUST 1968.  SEE--IEEE TRANSACTIONS ON AUDIO AND ELECTROACOUSTICSFFG
C     (JUNE 1967), SPECIAL ISSUE ON THE FAST FOURIER TRANSFORM.         FFG
      DIMENSION DATA(1), WORK(1), IFACT(32)                             FFG
      TWOPI=6.283185307*FLOAT(ISIGN)                                    FFG
C     FACTOR N INTO ITS PRIME FACTORS, NFACT IN NUMBER.  FOR EXAMPLE,   FFG
C     FOR N = 1960, NFACT = 6 AND IFACT(IF) = 2, 2, 2, 5, 7 AND 7.      FFG
      IF=0                                                              FFG
      NPART=N                                                           FFG
      DO 50 ID=1,N,2
      IDIV=ID
      IF (ID-1) 10,10,20
   10 IDIV=2
   20 IQUOT=NPART/IDIV
      IF (NPART-IDIV*IQUOT) 40,30,40
   30 IF=IF+1
      IFACT(IF)=IDIV
      NPART=IQUOT
      GO TO 20
   40 IF (IQUOT-IDIV) 60,60,50
   50 CONTINUE
   60 IF (NPART-1) 80,80,70
   70 IF=IF+1
      IFACT(IF)=NPART
   80 NFACT=IF
C     SHUFFLE THE DATA ARRAY BY REVERSING THE DIGITS OF THE INDEX.
C     REPLACE DATA(I) BY DATA(IREV) FOR ALL I FROM 1 TO N.  IREV-1 IS
C     THE INTEGER WHOSE DIGIT REPRESENTATION IN THE MULTI-RADIX
C     NOTATION OF FACTORS IFACT(IF) IS THE REVERSE OF THE REPRESENTATION
C     OF I-1.  FOR EXAMPLE, IF ALL IFACT(IF) = 2, THEN FOR I-1 = 11001,
C     IREV-1 = 10011.  A WORK ARRAY OF LENGTH N IS NEEDED.
      IP0=2
      IP3=IP0*N
      IWORK=1
      I3REV=1
      DO 110 I3=1,IP3,IP0
      WORK(IWORK)=DATA(I3REV)
      WORK(IWORK+1)=DATA(I3REV+1)
      IP2=IP3
      DO 100 IF=1,NFACT
      IP1=IP2/IFACT(IF)
      I3REV=I3REV+IP1
      IF (I3REV-IP2) 110,110,90
   90 I3REV=I3REV-IP2
  100 IP2=IP1
  110 IWORK=IWORK+IP0
      IWORK=1
      DO 120 I3=1,IP3,IP0
      DATA(I3)=WORK(IWORK)
      DATA(I3+1)=WORK(IWORK+1)
  120 IWORK=IWORK+IP0
C     PHASE-SHIFTED FOURIER TRANSFORM OF LENGTH IFACT(IF).
C     IPROD=IP1/IP0
C     IREM=N/(IFACT(IF)*IPROD)
C     DIMENSION DATA(IPROD,IFACT(IF),IREM),WORK(IFACT(IF))
C     COMPLEX DATA,WORK
C     DATA(I1,J2,I3) = SUM(DATA(I1,I2,I3) * W**(I2-1)), SUMMED OVER
C     I2 = 1 TO IFACT(IF) FOR ALL I1 FROM 1 TO IPROD, J2 FROM 1 TO
C     IFACT(IF) AND I3 FROM 1 TO IREM.
C     W = EXP(ISIGN*2*PI*I*(I1-1+IPROD*(J2-1))/(IPROD*IFACT(IF))).
      IF=0
      IP1=IP0
  130 IF (IP1-IP3) 140,240,240
  140 IF=IF+1
      IFCUR=IFACT(IF)
      IP2=IP1*IFCUR
      THETA=TWOPI/FLOAT(IFCUR)
      SINTH=SIN(THETA/2.)
      ROOTR=-2.*SINTH*SINTH
```

```
C     COS(THETA)-1, FOR ACCURACY
      ROOTI=SIN(THETA)
      THETA=TWOPI/FLOAT(IP2/IP0)
      SINTH=SIN(THETA/2.)
      WSTPR=-2.*SINTH*SINTH
      WSTPI=SIN(THETA)
      WMINR=1.
      WMINI=0.
      DO 230 I1=1,IP1,IP0
      IF (IFCUR-2) 150,150,170
 150  DO 160 I3=I1,IP3,IP2
      J0=I3
      J1=I3+IP1
      TEMPR=WMINR*DATA(J1)-WMINI*DATA(J1+1)
      TEMPI=WMINR*DATA(J1+1)+WMINI*DATA(J1)
      DATA(J1)=DATA(J0)-TEMPR
      DATA(J1+1)=DATA(J0+1)-TEMPI
      DATA(J0)=DATA(J0)+TEMPR
 160  DATA(J0+1)=DATA(J0+1)+TEMPI
      GO TO 220
 170  IWMAX=IP0*IFCUR
      DO 210 I3=I1,IP3,IP2
      I2MAX=I3+IP2-IP1
      WR=WMINR
      WI=WMINI
      DO 200 IWORK=1,IWMAX,IP0
      I2=I2MAX
      SUMR=DATA(I2)
      SUMI=DATA(I2+1)
 180  I2=I2-IP1
      TEMPR=SUMR
      SUMR=WR*SUMR-WI*SUMI+DATA(I2)
      SUMI=WR*SUMI+WI*TEMPR+DATA(I2+1)
      IF (I2-I3) 190,190,180
 190  WORK(IWORK)=SUMR
      WORK(IWORK+1)=SUMI
      TEMPR=WR
      WR=WR*ROOTR-WI*ROOTI+WR
 200  WI=TEMPR*ROOTI+WI*ROOTR+WI
      IWORK=1
      DO 210 I2=I3,I2MAX,IP1
      DATA(I2)=WORK(IWORK)
      DATA(I2+1)=WORK(IWORK+1)
 210  IWORK=IWORK+IP0
 220  TEMPR=WMINR
      WMINR=WMINR*WSTPR-WMINI*WSTPI+WMINR
 230  WMINI=TEMPR*WSTPI+WMINI*WSTPR+WMINI
      IP1=IP2
      GO TO 130
 240  RETURN
      END
-
LAGCOR
      SUBROUTINE LAGCOR(LA,A,LB,B,C,LSTART,LSTOP)
C
C     THIS ROUTINE CALCULATES A SAMPLE CROSS-CORRELATION OF THE RECORD
C          A OVER THE RECORD B WITH LAGS BETWEEN LSTART AND LSTOP AND
C          STORES THE RESULT IN C
C   **** CAUTION ***** THERE IS NO CHECK FOR A ZERO RECORD
C
```

```
      DIMENSION A(LA),B(LB),C(LA)
      DO 50 J=LSTART,LSTOP
      U=0.0
      SUMA=0.0
      SUMB=0.0
      SA=0.0
      SB=0.0
      IF(LB-(LA-J+1)) 10,10,20
   10 N=LB
      GO TO 30
   20 N=LA-J+1
      IF(N.GT.0) GO TO 30
      DO 25 I=J,LSTOP
   25 C(I)=-2.
      RETURN
   30 EN=N
      DO 40 I=1,N
      IJ=I+J-1
      SUMA=SUMA+A(IJ)
      SUMB=SUMB+B(I)
      SA=SA+A(IJ)*A(IJ)
      SB=SB+B(I)*B(I)
   40 U=U+A(IJ)*B(I)
      SUMA=SUMA/EN
      SUMB=SUMB/EN
      SA=SA-SUMA*SUMA*EN
      SB=SB-SUMB*SUMB*EN
   50 C(J)=(U-EN*SUMA*SUMB)/SQRT(SA*SB)
      RETURN
      END
```

```
                        END-OF-RECORD
                        END-OF-INFORMATION
```

D.9 Program RETD as modified to perform the basic analysis plus and analysis of covariance

```
      PROGRAM RETD(INPUT,OUTPUT,TAPE6=OUTPUT)                           FIX
C     MAIN PROGRAM                                                      RETD
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XRED
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RETD
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)           XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   RETD
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           RETD
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3),SSE(3)RETD
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      RETD
     +                MFUNC,IFILE,IERR                                  RETD
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           RETD
C     START,LAUNCH,SPLASH DOWN                                          JAN25
      DATA DATESC/180.,208.,265.,114.,144.,172.,189.,209.,268.,         DEC10
     X 283.,320.,404.,  290.,342.,354./                                 DEC10
C     SL4 SPLASH DOWN IS 39  FEB 8 1974                                 DEC10
      IOPLOT = 0                                                        RETD
      KSKIP = 0                                                         RETD
C     IFFF IS LOOP CONTROL TO ALLOW OVERLAY                             JAN25
      IFFF = -1                                                         RETD
    1 CALL RET                                                          RETD
      CALL STAT                                                         RETD
      GO TO 1                                                           RETD
      END                                                               RETD
      SUBROUTINE LINE(X,Y,N,M,L,LL)                                     LINE
C     X IS THE DATE. (INDEPENDENT VARIABLE)                             LINE
C     Y IS THE DATA. (DEPENDENT VARIABLE)                               LINE
C     IFLAG = 13   LAST POINT NOT VALID                                 LINE
C     JFLAG = 13   LAST POINT VALID                                     LINE
C     ISFLAG IS THE NUMBER OF POINTS PLOTED.                            LINE
      DIMENSION X(1), Y(1)                                              LINE
      DATA D/0.04/                                                      LINE
      IFLAG = 0                                                         LINE
      JFLAG = 0                                                         LINE
      ISFLAG = 0                                                        LINE
      IP = 3                                                            LINE
      IF(N - 1) 9,1,1                                                   LINE
    1 DO 6 I=1,N                                                        LINE
      II = I*M - M + 1                                                  LINE
      XP = (X(II) - X(N + M))/X(N + 2*M)                                LINE
      YP = (Y(II) - Y(N + M))/Y(N + 2*M)                                LINE
C     CHECK TO SEE IF POINT VALUE IS VALID.                             LINE
      IF(Y(II)) 3,13,23                                                 LINE
    3 IY = -Y(II) + 0.5                                                 LINE
      IF(IY - 2) 13,14,13                                               LINE
C     THIS IS ZERO ON THE GRAPH.                                        LINE
   14 YP = -Y(N+1)/Y(N+2*M)                                             LINE
      GO TO 23                                                          LINE
C     INVALID POINT.                                                    LINE
   13 IFLAG = 13                                                        LINE
      GO TO 6                                                           LINE
C     VALID POINT.  CHECK FOR CONTINUOUS DATE.                          LINE
   23 JFLAG = 13                                                        LINE
      IF(ISFLAG) 25,25,24                                               LINE
   24 IF(X(II) - X(II-M) - 1.5) 25,35,35                                LINE
   25 IF(IFLAG) 35,26,35                                                LIN
C     PLOT THIS PEN DOWN.                                               LIN
   26 CALL PLOT(XP,YP,IP)                                               LINE
      ISFLAG = ISFLAG + 1                                               LINE
      IP = 2                                                            LINE
      GO TO 6                                                           LINE
     DISCONTINUOUS GRAPH, PLOT AN X ON EACH END OF LINE.                LINE
  35 CALL WHERE(U,V,F)                                                  LINE
     IFLAG = 0                                                          LINE
     KFLAG = JFLAG*ISFLAG                                               LINE
     IF(KFLAG) 16,17,16                                                 LINE
  16  CALL SYMBOL(U,V,D,LL,0.0,-1)                                      LINE
     ISFLAG = ISFLAG + 1                                                LINE
  17 CALL SYMBOL(XP,YP,D,LL,0.0,-1)                                     LINE
     IP = 2                                                             LINE
     ISFLAG = ISFLAG + 1                                                LINE
   6 CONTINUE                                                           LINE
     KFLAG = IFLAG*JFLAG                                                LINE
     IF(KFLAG) 9,9,29                                                   LINE
  29 CALL WHERE(U,V,F)                                                  LINE
     CALL SYMBOL(U,V,D,LL,0.0,-1)                                       LINE
     ISFLAG = ISFLAG + 1                                                LINE
   9 RETURN                                                             LINE
     END                                                                LINE
     SUBROUTINE AXIS (X,Y,BCD,NC,SIZE,THETA,YMIN,DY,NDEC,NLAB,NTIC)     AXIS
     DIMENSION G(2), H(11)                                              AXIS
     DATA G/.8,.56/                                                     AXIS
     DATA H/.56,.4,.28,.2,.14,.1,.07,.05,.035,.025,.0175/               AXIS
     AC = NC                                                            AXIS
     SIG=SIGN(1.0,AC)                                                   AXIS
   2 NAC=IABS(NC)                                                       AXIS
     TH=THETA*0.017453294                                               AXIS
     IF(NLAB.LE.0) NLAB = 1                                             AXIS
     IF(NTIC.LE.0) NTIC = 1                                             AXIS
     FNLAB = NLAB                                                       AXIS
     N = SIZE*FNLAB + 0.1                                               AXIS
     N = SIZE + 0.50                                                    AXIS
     CTH = COS  (TH)                                                    AXIS
     STH = SIN  (TH)                                                    AXIS
     CTN = CTH/FNLAB                                                    AXIS
     STN = STH/FNLAB                                                    AXIS
     TN = N                                                             AXIS
     N1 = N + 1                                                         AXIS
     N2 = N1/2                                                          AXIS
     ADY=ABS(DY/FNLAB)                                                  AXIS
     ADY=ABS(DY)                                                        AXIS
     STAT=YMIN                                                          AXIS
     EXP = 0.0                                                          AXIS
     IF ( ADY ) 9,18,9                                                  AXIS
   9 IF ( ADY -100.0 ) 10,12,12                                         AXIS
  12 ADY = ADY / 10.0                                                   AXIS
     STAT=STAT/10.0                                                     AXIS
     EXP = EXP + 1.0                                                    AXIS
     GO TO 9                                                            AXIS
  14 ADY = ADY * 10.0                                                   AXIS
     STAT=STAT*10.0                                                     AXIS
     EXP = EXP - 1.0                                                    AXIS
  10 IF ( ADY - 1.00 ) 14,18,18                                         AXIS
  10 IF ( ADY - 0.01 ) 14,18,18                                         AXIS
  18 XA = X  - (.20 * SIG  - .05) *STH - .0857 * CTH                    AXIS
  18 XA = X  - (H(NLAB+1)  * SIG  - H(NLAB+5)) *STH - .0857 * CTH       AXIS
     YA = Y  + (.20 * SIG  - .05) * CTH - .0857 * STH                   AXIS
     YA = Y  + (H(NLAB+1) * SIG  - H(NLAB+5)) * CTH - .0857 * STH       AXIS
     I = 0                                                              AXIS
  25 I = I + 1                                                          AXIS
     CALL NUMBER (XA,YA,0.1,STAT,THETA,2)                               AXIS
```

```
      CALL NUMBER (XA,YA,H(NLAB+3),STAT,THETA,NDEC)                   AXIS
      STAT=STAT+SIGN(ADY,DY)                                          AXIS
C     XA = XA + CTH                                                   AXIS
      XA = XA + CTN                                                   AXIS
C     YA = YA + STH                                                   AXIS
      YA = YA + STN                                                   AXIS
      IF(I - N2) 25,31,26                                             AXIS
   26 IF(I - N1) 25,60,60                                             AXIS
   31 TNC = NAC + 7                                                   AXIS
C     XC = X + (SIZE / 2.0 -.06 * TNC)*CTH - (-.07 + SIG *.36)* STH   AXIS
      XC = X + (SIZE / 2.0 -H(NLAB+4) * TNC)*CTH                      AXIS
     1- (-H(NLAB+4) + SIG *(H(NLAB) + H(NLAB+3)))* STH                AXIS
C     YC = Y + (SIZE / 2.0 -.06 * TNC)*STH + (-.07 + SIG *.36)* CTH   AXIS
      YC = Y + (SIZE / 2.0 -H(NLAB+4) * TNC)*STH                      AXIS
     1+ (-H(NLAB+4) + SIG *(H(NLAB) + H(NLAB+3)))* CTH                AXIS
C     CALL SYMBOL (XC,YC,0.14,BCD,THETA,NAC)                          AXIS
      CALL SYMBOL (XC,YC,H(NLAB+2),BCD,THETA,NAC)                     AXIS
      XC = XC +((TNC -6.0) * 0.12)* CTH                               AXIS
      YC = YC +((TNC -6.0) * 0.12)* STH                               AXIS
      IF (EXP) 35,50,35                                               AXIS
C  35 CALL SYMBOL (XC,YC,0.14,@(X10   )@ ,THETA,7)                    AXIS
C  35 CALL SYMBOL (XC,YC,H(NLAB+2),@(X10   )@ ,THETA,7)               AXIS
   35 CALL SYMBOL (XC,YC,H(NLAB+2),7H(X10   ),THETA,7)                AXIS
C     XC = XC + .48 * CTH  -.07 * STH                                 AXIS
      XC=XC+.38*CTH-H(NLAB+4)*STH                                     DEC1
C     YC = YC + .48 * STH  +.07 * CTH                                 AXIS
      YC=YC+.38*STH+H(NLAB+4)*CTH                                     DEC1
C  40 CALL NUMBER (XC,YC,0.10,EXP,THETA,-1)                           AXIS
   40 CALL NUMBER (XC,YC,H(NLAB+3),EXP,THETA,-1)                      AXIS
   50 GO TO 25                                                        AXIS
   60 FNTIC = NTIC                                                    AXIS
      NT = N*NTIC                                                     AXIS
      TN = NT                                                         AXIS
      CTH = CTN/FNTIC                                                 AXIS
      STH = STN/FNTIC                                                 AXIS
      XB = X + TN*CTH                                                 AXIS
      YB = Y + TN*STH                                                 AXIS
      XDELT = - H(6 - NTIC) * SIG  * STH                              AXIS
      YDELT = H(6 - NTIC) * SIG  * CTH                                AXIS
      XA = XB + XDELT + XDELT                                         AXIS
C     XA = XB- 0.1 * SIG  * STH                                       AXIS
      YA = YB + YDELT + YDELT                                         AXIS
C     YA = YB+ 0.1 * SIG  * CTH                                       AXIS
      CALL PLOT (XA,YA,3)                                             AXIS
      XA = XA - XDELT                                                 AXIS
      YA = YA - YDELT                                                 AXIS
C     DO 20  I =1,N                                                   AXIS
      DO 20  I =1,N                                                   AXIS
      DO 20 II =1,NTIC                                                AXIS
      IF(II.LT.NTIC) GO TO 45                                         AXIS
      XX = XDELT                                                      AXIS
      YY = YDELT                                                      AXIS
      GO TO 46                                                        AXIS
   45 XX = 0.                                                         AXIS
      YY = 0.                                                         AXIS
   46 CONTINUE                                                        AXIS
      CALL PLOT (XB,YB,2)                                             AXIS
      XC = XB - CTH                                                   AXIS
      YC = YB - STH                                                   AXIS
      CALL PLOT (XC,YC,2)                                             AXIS
   XA = XA - CTH                                                     AXIS
   XA = XA - CTH + XX                                                AXIS
   YA = YA - STH                                                     AXIS
   YA = YA - STH + YY                                                AXIS
   CALL PLOT (XA,YA,2)                                               AXIS
   XA = XA - XX                                                      AXIS
   YA = YA - YY                                                      AXIS
   XB = XC                                                           AXIS
20 YB = YC                                                           AXIS
   RETURN                                                            AXIS
   END                                                               AXIS
   SUBROUTINE SCALE (X,S,N,K)                                        SCALE
                                                                     SCALE
WHERE-  X  IS THE NAME OF THE ARRAY OF DATA TO BE SCANNED FOR MAXIMUMSCALE
           AND MINIMUM VALUES. AN ADJUSTED MINIMUM VALUE WILL BE     SCALE
           STORED IN X(N*K+1). AN ADJUSTED DX(MAX.-MIN.) WILL BE     SCALE
           STORED IN X(N*K+K+1).                                     SCALE
        S  IS THE LENGTH OVER WHICH THIS DATA IS TO BE PLOTTED.      SCALE
        N  IS THE NUMBER OF DATA POINTS IN THE ARRAY X.              SCALE
        K  IS THE REFEAT CYCLE OF A MIXED ARRAY.(NORMALLY 1)         SCALE
                                                                     SCALE
   DIMENSION X(2)                                                    SCALE
   IT = 13                                                           SCALE
   NP = N * K                                                        SCALE
   L = NP + 1                                                        SCALE
   J = NP +K + 1                                                     SCALE
   XMAX = X(1)                                                       SCALE
   X(L) = X(1)                                                       SCALE
   DO 2 I=1,NP,K                                                     SCALE
   IF(X(I)) 2,2,3                                                    SCALE
 2 CONTINUE                                                          SCALE
 3 XMAX = X(I)                                                       SCALE
   X(L)= X(I)                                                        SCALE
   X(L)= 0.0                                                         SCALE
   DO 10 I = 1,NP,K                                                  SCALE
   IF(X(I)) 22,10,23                                                 SCALE
22 ITEST = 2.5 - X(I)                                                SCALE
   IF(ITEST) 10,24,10                                                SCALE
24 X(L) = 0.0                                                        SCALE
   IT = 0                                                            SCALE
   GO TO 10                                                          SCALE
23 IF (XMAX-X(I)) 5,6,6                                              SCALE
 5 XMAX = X(I)                                                       SCALE
 6 IF (X(L)-X(I))10,10,7                                             SCALE
 7 X(L) = X(I)                                                       SCALE
10 CONTINUE                                                          SCALE
   DX = (XMAX - X(L)) /S                                             SCALE
   IF (DX) 31,31,30                                                  SCALE
31 X(J) = 1.0                                                        SCALE
   X(L) = X(L) - 0.5                                                 SCALE
   RETURN                                                            SCALE
30 IDX = ALOG10 (DX)                                                 SCALE
   IXMN = X(L) * 10.0 ** (-IDX)                                      SCALE
   IF (X(L))32,33,34                                                 SCALE
32 IXMN = X(L) * 10.0 ** (-IDX) - 0.99                               SCALE
34 X(L) = IXMN                                                       SCALE
   X(L) = X(L) * 10.0 ** IDX                                         SCALE
33 DX = ALOG10 ((XMAX-X(L))/S)                                       SCALE
   IDX = DX                                                          SCALE
   XMAX = IDX                                                        SCALE
```

```
      DX=10.0**(DX-XMAX)                                                SCALE
      XMAX = 1.0                                                        SCALE
   41 IF (DX-1.0) 40,20,11                                              SCAL
   40 DX = DX * 10.0                                                    SCAL
      IDX = IDX - 1                                                     SCALE
      GO TO 41                                                          SCALE
   11 XMAX=2.0                                                          SCALE
      IF(DX-2.0) 20,20,12                                               SCALE
   12 XMAX = 4.0                                                        SCALE
      IF (DX-4.0) 20,20,13                                              SCALE
   13 XMAX=5.0                                                          SCALE
      IF(DX-5.0) 20,20,14                                               SCALE
   14 XMAX=8.0                                                          SCALE
      IF (DX-8.0) 20,20,15                                              SCALE
   15 XMAX=10.0                                                         SCALE
   20 X(J) = XMAX * 10.0 ** IDX                                         SCALE
      IF(IT) 49,49,39                                                   SCALE
   39 CONTINUE                                                          SCALE
      IMAX = XMAX + 0.00001                                             SCALE
      IXMN = X(L) * 10.0 ** (-IDX)                                      SCALE
      IMOD = IXMN/IMAX*IMAX                                             SCALE
      X(L) = IMOD                                                       SCALE
      X(L) = X(L) * 10.0 ** IDX                                         SCALE
      GO TO 59                                                          SCALE
   49 CONTINUE                                                          SCALE
      X(L) = 0.0                                                        SCALE
   59 CONTINUE                                                          SCALE
      RETURN                                                            SCALE
      END                                                               SCAL
      SUBROUTINE RET                                                    RET
C                                                                       RET
C MSC ENDOCRINE DATA RETREIVAL PROGRAM                                  RET
C     FIRST LOOK STATISTICS PROGRAM.                                    RET
C                                                                       RET
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XREDUC
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RET
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)           XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   RET
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           RET
C     COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      RET
      COMMON /SISBUF/ JBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      RET
     +               MFUNC,IFILE,IERR                                   RET
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           RET
      DIMENSION IBUF(14)                                                RET
      EQUIVALENCE(IBUF,T)                                               RET
      EXTERNAL ERROR                                                    RET
C                                                                       RET
C RA1=SAMPLE DIRECTORY  ***  RA2=URINE FILE  ***  RA3=BLOOD FILE        RET
C                       ***  RA4=DAILY FILE  ***                        RET
C                                                                       RET
C                                                                       RET
C PLACE KEYED FILES IN UPDATE MODE EXCLUDING @RA1@ WHICH IS             RET
C             TO BE USED AS A SEQUENTIAL SEARCH FILE                    RET
C             ASSIGNED TO FORTRAN UNIT NO. 1                            RET
C                                                                       RET
      IF(IFFF) 31,201,140                                               RET
C  31 CALL RANDOM(4,@RA2@,125,5,7,100 ,100 ,ICODE,LOC)                  RET
   31 CONTINUE                                                          RET
      CALL FILEIS(FITRA1,3LLFN,3LRA1,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +          ,3LMRL, 350,3LMNR, 350,3LWSA, T)                        RET
```

```
      CALL STOREF(FITRA1,3LERL,20)                                      RET
      CALL STOREF(FITRA1,2LEX,   ERROR)                                 RET
      CALL OPENM(FITRA1,3LI-O)                                          RET
      CALL REWND(FITRA1)                                                RET
      CALL FILEIS(FITRA2,3LLFN,3LRA2,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +            ,3LMRL,1250,3LMNR,1250,3LWSA, T)                      RET
      CALL STOREF(FITRA2,3LERL,0)                                       RET
      CALL STOREF(FITRA2,2LEX,   ERROR)                                 RET
      CALL OPENM(FITRA2,5LINPUT)                                        RET
      CALL REWND(FITRA2)                                                RET
      CALL FILEIS(FITRA3,3LLFN,3LRA3,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +            ,3LMRL, 350,3LMNR, 350,3LWSA, T)                      RET
      CALL STOREF(FITRA3,3LERL,0)                                       RET
      CALL STOREF(FITRA3,2LEX,   ERROR)                                 RET
      CALL OPENM(FITRA3,5LINPUT)                                        RET
      CALL REWND(FITRA3)                                                RET
      CALL FILEIS(FITRA4,3LLFN,3LRA4,2LKA,KEY,2LKL,10,2LKT,1LI,2LRB,5   RET
     +            ,3LMRL, 300,3LMNR, 300,3LWSA,T)                       RET
      CALL STOREF(FITRA4,3LERL,0)                                       RET
      CALL STOREF(FITRA4,2LEX,   ERROR)                                 RET
      CALL OPENM(FITRA4,5LINPUT)                                        RET
      CALL REWND(FITRA4)                                                RET
      IFFF = 0                                                          RET
C                                                                       RET
C INITIALIZE COUNTER FLAGS FOR THE FIRST PASS OF                        RET
C     ANY GIVEN RETREIVAL                                               RET
C                                                                       RET
  201 ISFLG = 1                                                         RET
      IDFLG = 1                                                         RET
      IMFLG = 1                                                         RET
      ITPFLG = 1                                                        RET
      ITTFLG = 1                                                        RET
      IFFF = 1                                                          RET
C                                                                       RET
C READ ONE DATA CARD                                                    RET
C                                                                       RET
    1 READ 200,(ISAV(I),I=1,16)                                         RET
  200 FORMAT(A4,1X,A4,1X,14I5)                                          RET
C                                                                       RET
C DETERMINE CARD TYPE AND COUNTER SEQUENCE                              RET
C                                                                       RET
      IF(ISAV(1).EQ.4HJOB ) GO TO 19                                    RET
      IF(ISAV(1).EQ.4HSTUD.AND.ISFLG.EQ.1) GO TO  5                     RET
      IF(ISAV(1).EQ.4HSTUD.AND.ISFLG.EQ.0) GO TO 45                     RET
      IF(ISAV(1).EQ.4HDATE.AND.IDFLG.EQ.1) GO TO  6                     RET
      IF(ISAV(1).EQ.4HDATE.AND.IDFLG.EQ.0) GO TO 46                     RET
      IF(ISAV(1).EQ.4HMAN .AND.IMFLG.EQ.1) GO TO  7                     RET
      IF(ISAV(1).EQ.4HMAN .AND.IMFLG.EQ.0) GO TO 47                     RET
      IF(ISAV(1).EQ.4HTYPE.AND.ITPFLG.EQ.1) GO TO  8                    RET
      IF(ISAV(1).EQ.4HTYPE.AND.ITPFLG.EQ.0) GO TO 48                    RET
      IF(ISAV(1).EQ.4HTEST.AND.ITTFLG.EQ.1) GO TO  9                    RET
      IF(ISAV(1).EQ.4HTEST.AND.ITTFLG.EQ.0) GO TO 49                    RET
      IF(ISAV(1).EQ.4HEND ) GO TO 40                                    RET
      IF(ISAV(1).EQ.4HEOF ) GO TO 99                                    RET
C                                                                       RET
C BUILD RETREIVAL CRITERIA ARRAYS                                       RET
C                                                                       RET
    5 JSTALL=0                                                          RET
      IS = 0                                                            RET
      ISFLG = 0                                                         RET
```

```
   45 CALL SETCRI(LSTUDY,IS,JSTALL)                                          RET
C     OUTPUT,(LSTUDY(I),I=1,5),IS,JSTALL                                    RET
      GO TO 1                                                               RET
    6 JDTALL=0                                                              RET
      ID = 0                                                                RET
      IDFLG = 0                                                             RET
   46 CALL SETCRI(LDATE,ID,JDTALL)                                          RET
C     OUTPUT,(LDATE(I),I=1,10),ID,JDTALL                                    RET
      GO TO 1                                                               RET
    7 MANALL=0                                                              RET
      IM = 0                                                                RET
      IMFLG = 0                                                             RET
   47 CALL SETCRI(LMAN,IM,MANALL)                                           RET
C     OUTPUT,(LMAN(I),I=1,9),IM,MANALL                                      RET
      GO TO 1                                                               RET
    8 JTPALL=0                                                              RET
      ITP = 0                                                               RET
      ITPFLG = 0                                                            RET
   48 CALL SETCRI(LTYPE,ITP,JTPALL)                                         RET
C     OUTPUT,(LTYPE(I),I=1,10),ITP,JTPALL                                   RET
      GO TO 1                                                               RET
    9 JTTALL=0                                                              RET
      ITT = 0                                                               RET
      ITTFLG = 0                                                            RET
   49 CALL SETCRI(LTEST,ITT,JTTALL)                                         RET
      IT1=1                                                                 RET
C     IF(JTTALL.EQ.1) ITT = 124                                             RET
      LSTART = ISAV(3)                                                      RET
      LSTOP  = ISAV(4)                                                      RET
      IF(LSTOP.EQ.0) LSTOP=LSTART                                           DEC1
      GO TO 1                                                               RET
   19 DO 119 I=1,16                                                         RET
  119 JOB(I)=ISAV(I)                                                        RET
      IF(IOPLOT.EQ.0.AND.JOB(3).GE.1000) CALL PLOTS(14HNASA ENDOCRINE,      RET
     1  14)                                                                 RET
      IF(JOB(3).GE.1000) IOPLOT = 999                                       RET
      IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH.OR.JOB(2).EQ.4HVOLU)GOTO1 DEC10
      JOB(2)=4HDATE                                                         DEC10
      PRINT 601                                                             DEC10
  601 FORMAT(* UNKNOWN JOB PARAMETER DATE ASSUMED*)                         DEC10
      GO TO 1                                                               RET
C                                                                           RET
C BUILD HIT ARRAY OF SAMPLE NUMBERS                                         RET
C                                                                           RET
   40 CONTINUE                                                              RET
      LT = LSTART - 1                                                       RET
C                                                                           RET
C     DO 4321 LT=LSTART,LSTOP                                               RET
  140 IF(IFFF - 2) 145,240,145                                              RET
  145 LT = LT + 1                                                           RET
C                                                                           RET
      IF(LT - LSTOP) 150,150,4321                                           RET
  150 LM = 0                                                                RET
      IFFF = 2                                                              RET
C     IF(KOT.EQ.0) CALL SSWTCH(1,KKT)                                       RET
C     IF(KKT.EQ.1) GO TO 999                                                RET
      LTEST(1) = LT                                                         RET
C     DO 4321 LM=1,3                                                        RET
  240 LM = LM + 1                                                           RET
      IF(LM - 3) 250,250,245                                                RET
  245 IFFF = 1                                                          RET
      GO TO 140                                                         RET
  250 LMAN(1) = LM                                                      RET
      IH = 1                                                            RET
C     REWIND 1                                                          RET
      CALL REWND(FITRA1)                                                RET
C                                                                       RET
C                                                                       RET
C THE KEYED (RA1) SAMPLE DIRECTORY FILE IS TREATED AS A SEQUENTIAL      RET
C     FILE DURING THE SEARCH FOR SAMPLES WHICH SATISFY                  RET
C                   THE INPUT CRITERIA                                  RET
C                                                                       RET
C  10 BUFFER IN(1,1)(IBUF(1),IBUF(14))                                  RET
   10 CALL GETN(FITRA1)                                                 RET
      IF(IFETCH(FITRA1,2LFP).EQ.100B) GO TO 23                          RET
    2 IF(JSTALL.EQ.1) GO TO 12                                          RET
      DO 11 I=1,IS                                                      RET
      IF(IBUF(2).EQ.LSTUDY(I)) GO TO 12                                 RET
   11 CONTINUE                                                          RET
      GO TO 10                                                          RET
   12 IF(JDTALL.EQ.1.AND.JOB(2).EQ.4HVOLU) GO TO 44                     RET
C                                                                       RET
C CHECK FOR SIMULTANEOUS @ALL@ AND DATE @SAVE@ OPTION                   RET
C                                                                       RET
      IF(JDTALL.EQ.1.AND.(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH))GO TO 41RET
      DO 13 I=1,ID                                                      RET
      IF(IBUF(3).EQ.LDATE(I)) GO TO 14                                  RET
   13 CONTINUE                                                          RET
      GO TO 10                                                          RET
   41 MDSAV = IBUF(3)                                                   RET
      GO TO 44                                                          RET
C                                                                       RET
C CHECK FOR DATE SAVE OPTION                                            RET
C                                                                       RET
   14 IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH) MDSAV=LDATE(I)           RET
   44  IF(MANALL.EQ.1) GO TO 16                                         RET
      DO 15 I=1,IM                                                      RET
      IF(IBUF(4).EQ.LMAN(I)) GO TO 16                                   RET
   15 CONTINUE                                                          RET
      GO TO 10                                                          RET
   16 IF(JTPALL.EQ.1) GO TO 18                                          RET
      DO 17 I=1,ITP                                                     RET
      IF(IBUF(5).EQ.LTYPE(I)) GO TO 18                                  RET
   17 CONTINUE                                                          RET
      GO TO 10                                                          RET
C                                                                       RET
C CHECK FOR MASTER SAMPLE NUMBER                                        RET
C                                                                       RET
   18 IF(IBUF(14).EQ.0) GO TO 21                                        RET
      MIH = IH-1                                                        RET
      DO 20 I=1,MIH                                                     RET
      IF(LHIT(I).EQ.IBUF(14)) GO TO 10                                  RET
   20 CONTINUE                                                          RET
      LHIT(IH)=IBUF(14)                                                 RET
C     PRINT 220,(LHIT(I),I=1,10)                                        RET
C 220 FORMAT(5X,5HLHIT2,5X,10I10)                                       RET
      GO TO 22                                                          RET
   21 LHIT(IH)=IBUF(1)                                                  RET
C     PRINT 221,(LHIT(I),I=1,10)                                        RET
C 221 FORMAT(5X,5HLHIT1,5X,10I10)                                       RET
```

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C                                                                         RET
C IF DATE SAVE OPTION WAS SPECIFIED FILL DATE ARRAY CORRESPONDING         RET
C     TO SAMPLE NUMBER HIT ARRAY                                          R
C                                                                         R
   22 IF(JOB(2).EQ.4HDATE.OR.JOB(2).EQ.4HBOTH) MDATE(IH)=MDSAV            RET
C                                                                         RET
C IF TOTAL VOLUME SAVE OPTION WAS SPECIFIED FILL VOLUME ARRAY             RET
C          CORRESPONDING TO SAMPLE NUMBER HIT ARRAY                       RET
C                                                                         RET
      IF(JOB(2).EQ.4HVOLU.OR.JOB(2).EQ.4HBOTH)MTVOL(IH)=IBUF(10)          RET
       IH=IH+1                                                            RET
      IF(IH.LE.151)  GO TO 10                                             XREDUC
   23 NSMP = IH - 1                                                       RET
      IF(NSMP.LE.150)  GO TO 35                                           XREDUC
      PRINT 30                                                            RET
   30 FORMAT(1H1,17HHIT FILE OVERFLOW    )                                RET
      STOP 30                                                             RET
C                                                                         RET
   35 CALL RETRVE                                                         RET
      PRINT 300, LSTUDY,LMAN,JOB,LTYPE,NSMP,NDATA                         RET
  300 FORMAT(1H0,6HLSTUDY,10I10,//,2X,4HLMAN,9I10,//,                     DEC10
     .   1X, 4HJOB ,A4,5X,A4,5X,14I6,//,6H LTYPE,20I5,//,                 RET
     .   1X, 7HNSMP = ,I5,10X,8HNDATA = ,I5)                              DEC10
      PRINT 301,(LDATE(I),I=1,ID)                                         RET
  301 FORMAT(6H LDATE /,(10I10))                                          RET
      PRINT 302,(LTEST(I),I=1,ITT)                                        RET
  302 FORMAT(6H LTEST  ,(10I10))                                          RET
      PRINT 306,(MTVOL(I),I=1,NSMP)                                       RET
  306 FORMAT(1H0,5HMTVOL,/,(10I10))                                       DEC10
      PRINT 303,(MDATE(I),I=1,NSMP)                                       RET
  303 FORMAT(1H0,5HMDATE,/,(10I10))                                       DEC10
      PRINT 304,(LHIT(I),I=1,NSMP)                                        RET
  304 FORMAT(/ ,6H LHIT ,/,(10I10))                                       DEC10
      PRINT 305,(XDATA(I),I=1,NDATA)                                      RET
  305 FORMAT(1H0,5HXDATA,/,(8F15.6))                                      DEC10
C     PRINT 300, LSTUDY,LMAN,JOB,LTYPE,NSMP,NDATA                         RET
C 300 FORMAT(1H1,6HLSTUDY,10I10,//,2X,4HLMAN,9I10,//,                     RET
C    .        4HJOB ,A4,5X,A4,5X,14I6,//,5HLTYPE,20I5,//,                 RET
C    .        7HNSMP = ,I5,10X,8HNDATA = ,I5,// )                         RET
C     PRINT 301,(LDATE(I),I=1,ID)                                         RET
C 301 FORMAT(5HLDATE /,(10I10))                                           RET
C     PRINT 302,(LTEST(I),I=1,ITT)                                        RET
C 302 FORMAT(5HLTEST  ,(10I10))                                           RET
C     PRINT 306,(MTVOL(I),I=1,NSMP)                                       RET
C 306 FORMAT(1H1,5HMTVOL,/,(10I10))                                       RET
C     PRINT 303,(MDATE(I),I=1,NSMP)                                       RET
C 303 FORMAT(1H1,5HMDATE,/,(10I10))                                       RET
C     PRINT 304,(LHIT(I),I=1,NSMP)                                        RET
C 304 FORMAT(//,5HLHIT ,/,(10I10))                                        RET
C     PRINT 305,(XDATA(I),I=1,NDATA)                                      RET
C 305 FORMAT(1H1,5HXDATA,/,(8F15.6))                                      RET
C                                                                         RET
C                                                                         RET
C     ------------------------------------------------------------------ RET
      RETURN                                                              RE
C     CALL STAT                                                           RE
 4321 CONTINUE                                                            RET
      IFFF = 0                                                            RET
C                                                                         RET
C     ------------------------------------------------------------------ RET
```

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C                                                                       RET
C     REWIND 1                                                          RET
      CALL REWND(FITRA1)                                                RET
      GO TO 201                                                         RET
C                                                                       RET
  888 PRINT 8800                                                        RET
 8800 FORMAT(15H FILE 1 REWOUND)                                        RET
      RETURN                                                            RET
   99 CONTINUE                                                          RET
      CALL CLOSEM(FITRA1)                                               RET
      CALL CLOSEM(FITRA2)                                               RET
      CALL CLOSEM(FITRA3)                                               RET
      CALL CLOSEM(FITRA4)                                               RET
      IF(IOPLOT) 199,199,999                                            RET
  999 CALL STOPPLT                                                      RET
      PRINT 900                                                         RET
  900 FORMAT(19H0NORMAL END OF JOB.)                                    RET
      STOP 2000                                                         RET
  199 STOP 1                                                            RET
      END                                                               RET
      SUBROUTINE SETCRI(LBUF,JNDX,LALL)                                 SETCRI
C  THIS SUBROUTINE STORES INFORMATION FROM ONE DATA CARD INTO THE       SETCRI
C                           CORRESPONDING CRITERIA ARRAY                SETCRI
C                                                                       SETCRI
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          SETCRI
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)           XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),   SETCRI
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA           SETCRI
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEY,KYE,      SETCRI
     +                MFUNC,IFILE,IERR                                  SETCRI
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)           SETCRI
      DIMENSION LBUF(1)                                                 SETCRI
      IF(ISAV(2).EQ.4HALL .OR.ISAV(2).EQ.4H     ) GO TO 1               SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=ISAV(3)                                                SETCRI
      IF(ISAV(2).EQ.4HEACH) GO TO 3                                     SETCRI
      INXT=ISAV(3)+1                                                    SETCRI
    2 IF(INXT.GT.ISAV(4)) RETURN                                        SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=INXT                                                   SETCRI
      INXT=INXT+1                                                       SETCRI
      GO TO 2                                                           SETCRI
    3 DO 5 I=4,16                                                       SETCRI
      IF(ISAV(I).EQ.0) RETURN                                           SETCRI
      JNDX = JNDX + 1                                                   SETCRI
      LBUF(JNDX)=ISAV(I)                                                SETCRI
    5 CONTINUE                                                          SETCRI
      RETURN                                                            SETCRI
    1 LALL=1                                                            SETCRI
      RETURN                                                            SETCRI
      END                                                               SETCRI
      SUBROUTINE RETRVE                                                 RETRVE
C                                                                       RETRVE
C THIS SUBROUTINE RETREVES THOSE DATA VALUES FROM THE BLOOD OR          RETRVE
C       URINE FILES WHICH SATISFY THE INPUT CRITERIA                    RETRVE
C       THE DATA VALUES ARE STORED IN ARRAY XDATA                       RETRVE
C                                                                       RETRVE
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP        XREDUC
C     COMMON /INDEX/INDX(124),INDX1(124),INDX2(248),INDX3(124)          RETRVE
      COMMON/INDEX/INDX(136),INDX3(136)                                 DEC10
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)             XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),     RETRVE
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA             RET
      COMMON /SISBUF/ IBUF(35),IBL(125),IUR(35),IBUFF(30),KEE,KYE,        RET
     +                MFUNC,IFILE,IERR                                    RETRVE
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)             RETRVE
      DIMENSION XTEMP(125)                                                RETRVE
      INTEGER KEY(2)                                                      RETRVE
      EQUIVALENCE(T,XTEMP)                                                RETRVE
      EQUIVALENCE (KEE,KEY(2))                                            RETRVE
      DATA(INDX(I),I=1,136)/400,401,402,403,404,405,503,406,407,408,409,DEC10
     .  410,                                                              DEC10
     1  411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,DEC10
     2  427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,DEC10
     3  443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,DEC10
     4  459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,DEC10
     5  475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,DEC10
     6  491,492,493,494,495,496,497,498,499,500,501,502,300,301,302,303,DEC10
     7  304,305,306,307,321,308,309,310,311,312,313,314,315,316,317,318,DEC10
     .  319,                                                              DEC10
     8  320,514,515,516,517,518,519,520,521,522,523/                      DEC10
      DATA (INDX3(I),I=1,136)/2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,    DEC10
     1  18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,   DEC10
     2  39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,   DEC10
     3  60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,   DEC10
     4  81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,     DEC10
     5101,102,103,104,105,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,DEC10
     6  20,21,22,23,116,117,118,119,120,121,122,123,124,125/              DEC10
      DATA ICDT/445B/                                                     RET
      M=1                                                                 RET
      KSAV=0                                                              RETRVE
      IERR=0                                                              RETRVE
      DO 27 K=1,NSMP                                                      RETRVE
      DO 27 I=1,ITT                                                       RETRVE
C                                                                         RETRVE
C   IDENTIFY TEST NUMBER IN INDEX                                         RETRVE
C                                                                         RETRVE
      DO 24 J=1,136                                                       DEC10
      IF(LTEST(I).EQ.INDX(J)) GO TO 25                                    DEC10
   24 CONTINUE                                                            DEC10
      STOP @INVALID TEST NUMBER@                                          DEC10
   25 IJ=J                                                                DEC10
      LREC=INDX3(IJ)                                                      DEC10
      IF(LTEST(I) -400) 41,31,31                                          RETRVE
   31 INDX1 = 1RU                                                         RETRVE
      GO TO 50                                                            RETRVE
   41 INDX1 = 1RB                                                         RETRVE
C                                                                         RETRVE
C   PICK UP KEY FROM HIT ARRAY OF SAMPLE NUMBERS                          RETRVE
C                                                                         RETRVE
   50 KEY(2)=LHIT(K)                                                      RETRVE
C                                                                         RETRVE
C  DETERMINE IF DATA NEEDED IS FROM CURRENT RECORD                        RETRVE
C                                                                         RETRVE
      IF(KEY(2).EQ.KSAV) GO TO 26                                         RET  E
C                                                                         RET  E
C   CHECK FOR URINE OR BLOOD FILE                                         RETRVE
C                                                                         RETRVE
C  29 IF(INDX1(IJ).EQ.1RU) GO TO 28                                       RETRVE
   29 IF(INDX1.EQ.1RU) GO TO 28                                           RETRVE
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C     CALL RANDOM(1,@RA3@,XTEMP,32,KEY,100 ,100 ,ICODE,LOC)                 RETRVE
      CALL GET(FITRA3)                                                       RETRVE
      LOC = 3                                                                RETRVE
      IFILE = 3                                                              RETRVE
      IF(IERR.NE.0) GO TO 100                                                RETRVE
      GO TO 26                                                               RETRVE
C  28 CALL RANDOM(1,@RA2@,XTEMP,125,KEY,100 ,100 ,ICODE,LOC)                RETRVE
   28 CALL GET(FITRA2)                                                       RETRVE
      LOC = 2                                                                RETRVE
      IFILE = 2                                                              RETRVE
      IF(IERR.NE.0) GO TO 100                                                RETRVE
C                                                                            RETRVE
C                                                                            RETRVE
C FETCH WORD NUMBER OF DATA RECORD FROM INDEX, STORE DATA                    RETRVE
C    VALUE IN CURRENT XDATA LOCATION AND INCREMENT                           RETRVE
C           XDATA LOCATION COUNTER M                                         RETRVE
C                                                                            RETRVE
C                                                                            RETRVE
C  26 LREC=INDX3(IJ)                                                         RETRVE
   26 XDATA(M)=XTEMP(LREC)                                                   RETRVE
   30 M=M+1                                                                  RETRVE
      IF(M.GT.150)  GO TO 110                                                XREDUC
      KSAV=KEY(2)                                                            RETRVE
   27 CONTINUE                                                               RETRVE
C                                                                            RETRVE
C                                                                            RETRVE
C NDATA = NUMBER OF DATA VALUES RETREIVED                                    RETRVE
C                                                                            RETRVE
C                                                                            RETRVE
      NDATA=M-1                                                              RETRVE
      RETURN                                                                 RETRVE
  100 IF(IERR .EQ.ICDT) GO TO 105                                            RETRVE
      PRINT 101,IERR ,KEY(2)                                                 RETRVE
  101 FORMAT(1H ,19HRANDOM ERROR-RETRVE,O8,5X,I4)                            RETRVE
      STOP 100                                                               RETRVE
  105 PRINT 104,KEY(2)                                                       RETRVE
  104 FORMAT(1H ,27HSAMPLE NO. NOT FOUND-RETRVE,5X,I4)                       RETRVE
      XDATA(M)=-1.                                                           RETRVE
      IERR=0                                                                 RETRVE
      GO TO 30                                                               RETRVE
  110 PRINT 111                                                              RETRVE
  111 FORMAT(1H1,43HDATA BUFFER FULL BEFORE ALL DATA RETREIVED    )          RETRVE
      STOP 110                                                               RETRVE
      END                                                                    RETRVE
      SUBROUTINE STAT                                                        STAT
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP             XREDUC
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)                XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),        STAT
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMP,NDATA                STAT
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3),SSE(3)STAT
      COMMON CHEM(200),TIME(200),NOB(3),TREAT(6),SL(6),SS(12),XMSC(12)       ANAC1
     2    ,F(12),PROBF(12),XM(6),YM(6),NDFC(12),SXX(6),SYY(6),SXY(6)         ANAC1
      COMMON ZCH(2,60),WORK(2,60)                                            ANAC1
      DIMENSION C(28)                                                        ANAC1
      REAL KSTUDY, KTYPE, KMAN, KTEST, NITS                                  STAT
      DIMENSION ISIG(2)                                                      STAT
      DIMENSION X(1)                                                         STAT
      DIMENSION LTEXT(120), MTEXT(120), XOUT(120)                            STAT
      DIMENSION NDF(3), S(3), P(3), TM(3), WTV(3), XMS(3), IPP(3),IP2(3)STAT
      DIMENSION ID1(120), ID2(120), LK(3)                                    STAT
      EQUIVALENCE(X,XDATA)                                                STAT
      DATA ID1/120*1/, LK/3*0/                                            STAT
      DATA IPP/4HPRE , 4HIN  , 4HPOST/                                    STA
      DATA IP2/8HPRE-IN  , 8HIN-POST , 8HPRE-POST/                        STA
C                                                                         STAT
C     FILL OUTPUT ARRAY                                                   STAT
C                                                                         STAT
      DATA ISTAR/1H*/, IBLANK/1H /, ISAVE/4HSAVE/                         STAT
      DATA IPLUS/1H+/, IMINUS/1H-/, IPPL/2H++/, IMM1/2H--/                STAT
      DATA IDATE/4HDATE/, IVOLU/4HVOLU/, IBOTH/4HBOTH/                    STAT
      NOBS = NDATA                                                        STAT
    1 IF(NOBS - 1) 999,999,2                                              STAT
    2 LOOP = IIT                                                          STAT
      IDATEF = 0                                                          STAT
      IVOLUF = 0                                                          STAT
      IF(JOB(2).EQ.IDATE) IDATEF = 3                                      STAT
      IF(JOB(2).EQ.IVOLU) IVOLUF = 3                                      STAT
      IF(JOB(2).NE.IBOTH) GO TO 3                                         STAT
      IDATEF = 3                                                          STAT
      IVOLUF = 3                                                          STAT
    3 KKK = NOBS/LOOP                                                     STAT
      CALL TEXT(LSTUDY(1), LTYPE(1), LMAN(1), LTEST(1),                   STAT
     X KSTUDY, KTYPE, KMAN, KTEST, NITS)                                  STAT
      CALL DATE(IWORD)                                                    STAT
      PRINT 1000, JOB(3)                                                  STAT
 1000 FORMAT(1H1,20X,42HNASA MSC ENDOCRINE DATA RETREIVAL PROGRAM.,I7/) STAT
      PRINT 500, LSTUDY(1), KSTUDY,IWORD                                  STAT
  500 FORMAT(7H0STUDY,,I2,2x, A8,20X,A10)                                 STAT
      PRINT 600, LTEST(1), KTEST,LMAN(1), KMAN                            STAT
  600 FORMAT(6H0TEST,,I3,2X A8 ,20X,4HMAN,,I4,2X, A8)                     STAT
      PRINT 700,(LTYPE(I),I=1,ITP)                                        STAT
  700 FORMAT(6H0TYPE,,20I3)                                               DEC1
      PRINT 800, NITS                                                     DEC1
  800 FORMAT(15H0JULIAN DATE    , A8)                                     STAT
C     DO 150 L=1,LOOP                                                     STAT
      L = 1                                                               STAT
      LOOP = 1                                                            STAT
      DO 210 II=LOOP,NOBS,LOOP                                            STAT
      I = II + L - LOOP                                                   STAT
      IPLACE = II/LOOP                                                    STAT
  210 XOUT(IPLACE) = XDATA(I)                                             STAT
C                                                                         STAT
C     SORT BY DATE                                                        STAT
C                                                                         STAT
      NOSLTS = NOBS/LOOP                                                  STAT
      NM1 = NOSLTS - 1                                                    STAT
      DO 230 I=1,NM1                                                      STAT
      IMAX = 9999                                                         STAT
      ISUB = I                                                            STAT
      DO 220 J=I,NOSLTS                                                   STAT
      IF(IMAX-MDATE(J)) 220,220,211                                       STAT
  211 IMAX = MDATE(J)                                                     STAT
      ISUB = J                                                            STAT
  220 CONTINUE                                                            STAT
      ITEMP = MDATE(ISUB)                                                 STAT
      TEMP = XOUT(ISUB)                                                   STAT
      MDATE(ISUB) = MDATE(I)                                              STAT
      XOUT(ISUB) = XOUT(I)                                                STAT
      MDATE(I) = ITEMP                                                    STAT
      XOUT(I) = TEMP                                                      STAT
  230 CONTINUE                                                          STAT
      IG = LSTUDY(1)                                                    STAT
      IVV(1)=IVV(2)=IVV(3)=0                                            APR24
      IVV(4) = NOSLTS                                                   STAT
      DO 240 I=1,NOSLTS                                                 STAT
      IF(MDATE(I).LE.DATESC(2,IG)) IVV(2) = I                           STAT
      IF(MDATE(I).LE.DATESC(3,IG)) IVV(3) = I                           STAT
  240 XDATA(I) = XOUT(I)                                                STAT
      DO 133 I=1,3                                                      STAT
      NFIRST = IVV(I) + 1                                               STAT
      NLAST = IVV(I + 1)                                                STAT
      CALL MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                     STAT
      SSMEAN(I) = SMEAN                                                 STAT
      SSIGMA(I) = SIGMA                                                 STAT
      NNN(I) = NN                                                       STAT
  133 CONTINUE                                                          STAT
      NFIRST = 1                                                        STAT
      NLAST = NOSLTS                                                    STAT
      CALL MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                     STAT
C                                                                       STAT
C     IF THERE ARE 2 OR MORE PRE-FLIGHT OBSERVATIONS THE EXTREME VALUES STAT
C     ARE FLAGED ON THE BASIS OF PRE-FLIGHT MEAN AND STD. DEV.          STAT
C     OTHERWISE THE TOTAL MEAN AND STD. DEV. ARE USED.                  STAT
C                                                                       STAT
      IF(NNN(1) - 2) 134,136,136                                        STAT
  134 SSG = SIGMA                                                       STAT
      SSM = SMEAN                                                       STAT
      GO TO 137                                                         STAT
  136 SSG = SSIGMA(1)                                                   STAT
      SSM = SSMEAN(1)                                                   STAT
  137 T01 = 2.3263*SSG                                                  STAT
      T05 = 1.6449*SSG                                                  STAT
      DO 166 II=1,3                                                     STAT
      IFIRST = IVV(II)+ 1                                               STAT
      ILAST = IVV(II + 1)                                               STAT
      IF(IFIRST-ILAST)162,163,166                                       APR24
  163 PRINT 401                                                         APR24
  401 FORMAT(*  SINGLE VALUE NOT ANALYZED*)                             APR24
  162 DO 165 I=IFIRST,ILAST                                             STAT
      MTEXT(I) = IBLANK                                                 STAT
      IF(X(I)) 164,165,153                                              STAT
  153 DELTA = X(I) - SSM                                                STAT
      IF(DELTA) 155,154,157                                             STAT
  154 IF(X(I).NE.2.0) GO TO 164                                         STAT
      DELTA = SSM                                                       STAT
      GO TO 156                                                         STAT
  155 DELTA = -DELTA                                                    STAT
  156 IF(DELTA.GE.T05) MTEXT(I) = IMINUS                                STAT
      IF(DELTA.GE.T01) MTEXT(I) = IMM1                                  STAT
      GO TO 164                                                         STAT
  157 IF(DELTA.GE.T05) MTEXT(I) = IPLUS                                 STAT
      IF(DELTA.GE.T01) MTEXT(I) = IPPL                                  STAT
  164 PRINT 400,MDATE(I), X(I), LTEXT(I), MTEXT(I)                      STAT
  165 CONTINUE                                                          STAT
      PRINT 900,SSMEAN(II), SSIGMA(II), NNN(II)                         STAT
  166 CONTINUE                                                          STAT
      IF(JOB(3) - 1000) 150,145,145                                     STAT
  145 IF(NN) 150,150,146                                                STAT
  146 CALL STPLOT(LOOP,NOBS,MSLOT,IWORD,KSTUDY,KTYPE,KMAN,KTEST,SMEAN,  STAT
     X SIGMA)                                                           STAT
  150 CONTINUE                                                          STAT
C                                                                       STAT
C       ICASE = 0     NO TESTS                                          STAT
C       ICASE = 1     PREFLIGHT ONLY                                    STAT
C       ICASE = 2     PRE AND INFLIGHT ONLY                             STAT
C       ICASE = 3     ALL                                               STAT
C       ICASE = 4     PRE AND POSTFLIGHT ONLY                           STAT
C                                                                       STAT
      IF(NNN(1)-1) 170,170,171                                          DEC10
  170 NT = 0                                                            STAT
      ICASE = 0                                                         STAT
      GO TO 999                                                         DEC10
  171 SSE(1) = SSIGMA(1)/SQRT(FLOAT(NNN(1)))                            STAT
      PRINT 3000,NNN(1), SSMEAN(1), SSIGMA(1), SSE(1)                   STAT
 3000 FORMAT(20(4H----)/23H PARAMETRIC STATISTICS,//8H0SUMMARY/         STAT
     X39H0SAMPLE  N     MEAN          SD          SE/4H0PRE, I6, 3F11.3) STAT
      IF(NNN(2)-1) 172,172,176                                          DEC10
  172 IF(NNN(3)-1) 173,173,174                                          DEC10
  173 NT = 1                                                            STAT
      ICASE = 1                                                         STAT
      GO TO 999                                                         DEC10
  174 SSE(3) = SSIGMA(3)/SQRT(FLOAT(NNN(3)))                            STAT
      PRINT3010,NNN(3), SSMEAN(3), SSIGMA(3), SSE(3)                    STAT
      NT = 2                                                            STAT
      ICASE = 4                                                         STAT
      NN=NN-NNN(2)                                                      FIX2
C                                                                       STAT
      GO TO 180                                                         DEC10
C     CHANGE THIS LATER                                                 STAT
C                                                                       STAT
  176 SSE(2) = SSIGMA(2)/SQRT(FLOAT(NNN(2)))                            STAT
      PRINT3020,NNN(2), SSMEAN(2), SSIGMA(2), SSE(2)                    STAT
 3020 FORMAT(4H0IN ,I6,3F11.3)                                          STAT
      IF(NNN(3)-1) 177,177,178                                          DEC10
  177 NT = 2                                                            STAT
      ICASE = 2                                                         STAT
      NN=NN-NNN(3)                                                      FIX2
      GO TO 180                                                         STAT
  178 SSE(3) = SSIGMA(3)/SQRT(FLOAT(NNN(3)))                            STAT
      PRINT3010,NNN(3), SSMEAN(3), SSIGMA(3), SSE(3)                    STAT
 3010 FORMAT(5H0POST,I5,3F11.3)                                         STAT
      NT = 3                                                            STAT
      ICASE = 3                                                         STAT
  180 CONTINUE                                                          STAT
      SE = SIGMA/SQRT(FLOAT(NN))                                        STAT
      PRINT 3030, NN, SMEAN, SIGMA, SE                                  STAT
 3030 FORMAT(4H ---,10(4H----)/4H SUM,I6,3F11.3)                        STAT
C                                                                       STAT
C     GET RID OF NEGATIVE VALUES                                        STAT
C         I  RANGES OVER ALL POINTS.                                    STAT
C         J  RANGES OVER VALID POINTS.                                  STAT
C                                                                       STAT
      J = 1                                                             STAT
      DO 330 I=1,NOSLTS                                                 STA
      IF(X(I)) 310,330,320                                              STA
  310 IF(X(I) + 2.0) 330,315,330                                        STA
  315 X(J) = 0.0                                                        STA
      GO TO 321                                                         ANAC1
  320 X(J) = X(I)                                                       STAT
  321 XOUT(J)=MDATE(I)                                                  ANAC1
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      J = J + 1                                                         STAT
  330 CONTINUE                                                          STAT
C     SET FLAG FOR ANACOVA                                              ANAC1
      IF(LMAN(1).EQ.1) IANC=1                                           ANAC1
      IF(ICASE.EQ.2.OR.ICASE.EQ.3) GO TO 322                            ANAC1
      PRINT 605                                                         ANAC1
  605 FORMAT(*  MISSING INFLIGHT DATA - NO ANACOVA POSSIBLE*)           ANAC1
      IANC=0                                                            ANAC1
      GO TO 716                                                         ANAC1
C     PICK INFLIGHT DATA ONLY INTO CHEM AND TIME                        ANAC1
C     X IS CHANGED HERE AND LATER                                       ANAC1
  322 IF(LMAN(1).EQ.1) LOBS=0                                           ANAC1
      I=NNN(1)+1                                                        ANAC1
      J=NNN(1)+NNN(2)                                                   ANAC1
      DO 714 K=I,J                                                      ANAC1
      LOBS=LOBS+1                                                       ANAC1
      CHEM(LOBS)=X(K)                                                   ANAC1
      TIME(LOBS)=XOUT(K)                                                ANAC1
  714 CONTINUE                                                          ANAC1
      NOB(LMAN(1))=NNN(2)                                               ANAC1
  716 CONTINUE                                                          ANAC1
      IF(ICASE.EQ.4) 710,711                                            FIX
  710 IF(NNN(2).EQ.1) GO TO 712                                         FIX
      GO TO 713                                                         FIX
  712 NNN1=NNN(1)+1                                                     FIX
      NSLTM1=J-1                                                        FIX
      DO 179 I=NNN1,NSLTM1                                              FIX
  179 X(I)=X(I+1)                                                       FIX
  713 NNN(2)=NNN(3)                                                     FIX
      NNN(3)=0                                                          FIX
  711 CONTINUE                                                          FIX
      CALL ACRDAN(X, NT, NNN, TM, WTV, S, GM, NDF, IER)                 STAT
      N1 = NDF(1)                                                       STAT
      N2 = NDF(2)                                                       STAT
      S1 = S(1)                                                         STAT
      S2 = S(2)                                                         STAT
      CALL FFOUT(S1,S2,N1,N2,FVAL,PRFVAL)                               STAT
      DO 193 IMS=1,3                                                    STAT
  193 XMS(IMS) = S(IMS)/NDF(IMS)                                        STAT
      PRINT 3090                                                        STAT
 3090 FORMAT(1X)                                                        STAT
      PRINT 3100                                                        STAT
 3100 FORMAT(28H0ANALYSIS OF VARIANCE TABLE./35H0        DF       SS    STAT
     X  MS      F /35H        ----     ----        ----    ---)         STAT
      PRINT 3200, NDF(1), S(1), XMS(1), FVAL                            STAT
 3200 FORMAT(6H TREAT, I4, F10.1, F10.1, F8.3)                          STAT
      PRINT 3300, NDF(2), S(2), XMS(2)                                  STAT
 3300 FORMAT(6H0ERROR, I4, F10.1, F10.1, 6H  --- /4H ---, 9(4H----))    STAT
      PRINT 3400, NDF(3), S(3), XMS(3)                                  STAT
 3400 FORMAT(6H TOTAL, I4, F10.1, F10.1, 6H  --- )                      STAT
      PRINT 3800, FVAL, PRFVAL                                          STAT
 3800 FORMAT(1H0,F7.3, 23H IS SIGNIFICANT AT THE  ,F5.1, 14H PERCENT LEVSTAT
     1EL)                                                               STAT
      IF(NT-2) 999,850,824                                              DEC10
  824 IF(PRFVAL - 5.0) 825,825,850                                      STAT
  825 N1 = 1                                                            STAT
      PRINT 3500                                                        STAT
 3500 FORMAT(14H0CONTRAST   F )                                         STAT
      P(1) = 1                                                          STAT
      P(2) = -1                                                         STAT
      P(3)=0                                                            FIX
      CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                          STAT
      CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                               STAT
      PRINT 3600,IP2(1),FVAL,PRFVAL                                     FIX
 3600 FORMAT(1H0,A8,F8.3,23H IS SIGNIFICANT AT THE   ,F5.1,             FIX
     X15H PERCENT LEVEL.)                                               STAT
      P(1) = 0                                                          STAT
      P(2) = 1                                                          STAT
      P(3) = -1                                                         STAT
      CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                          STAT
      CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                               STAT
      PRINT 3600,IP2(2),FVAL,PRFVAL                                     FIX
      P(1) = 1                                                          STAT
      P(2) = 0                                                          STAT
      CALL ACTRST(TM,  NNN, 3, 1, P, 1, Q, SQ)                          STAT
      CALL FFOUT(SQ,S2,N1,N2,FVAL,PRFVAL)                               STAT
      PRINT 3600,IP2(3),FVAL,PRFVAL                                     FIX
  850 CONTINUE                                                          STAT
  851 NP = 0                                                            STAT
      DO 855 I=1,NT                                                     STAT
      NCDC = NNN(I)                                                     STAT
      DO 855 J=1,NCDC                                                   STAT
      NP = NP + 1                                                       STAT
  855 ID2(NP) = I                                                       STAT
      IF(ICASE.EQ.4) GO TO 860                                          DEC1
      PRINT 4000                                                        STAT
 4000 FORMAT(1H0/20(4H----)/27H NON-PARAMETRIC STATISTICS.)             STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0,NT,NNN,LK)                         STAT
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,NT,NNN,LK,LK)                       FIX2
      PRINT 1100,IP2(1)                                                 STAT
 1100 FORMAT(1H0/10H0CONTRAST , A8)                                     STAT
      NP = NNN(1) + NNN(2)                                              STAT
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0, 2,NNN,LK)                         STAT
      IPI=2                                                             FIX2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)                       FIX2
      IF(ICASE.EQ.2) GO TO 998                                          FIX
      NP = NNN(2) + NNN(3)                                              STAT
      IST = NNN(1) + 1                                                  STAT
      PRINT 1100,IP2(2)                                                 STAT
C     CALL  KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,0,2,NNN(2),LK)        STAT
      IPI=3                                                             FIX2
      CALL KRUSWAL(X(IST),ID1(IST),ID2(IST),NP,0,1,2,NNN(2),LK,IPI)     FIX2
      NCDC = NNN(3)                                                     STAT
      DO 880 J=1,NCDC                                                   STAT
      K = NNN(1) + J                                                    STAT
      L=NNN(1)+NNN(2)+J                                                 FIX
      X(K) = X(L)                                                       STAT
      ID1(K) = ID1(L)                                                   STAT
  880 ID2(K) = ID2(L)                                                   STAT
      NP=NNN(1)+NNN(3)                                                  FIX
      NNN(2)=NNN(3)                                                     FIX
C     CALL  KRUSWAL(X,ID1,ID2,NP,0,0, 2,NNN,LK)                         STAT
  860 PRINT 1100,IP2(3)                                                 DEC10
      IPI=3                                                             FIX2
      IF(ICASE.EQ.4) IPI=2                                              FIX2
      CALL KRUSWAL(X,ID1,ID2,NP,0,1,2,NNN,LK,IPI)                       FIX
  998 CONTINUE                                                          FIX
      IF(LMAN(1).LT.3.OR.IANC.NE.1) GO TO 999                           ANAC1
      PRINT 1000,JOB(3)                                                 ANAC1
      PRINT 604,LSTUDY(1),KSTUDY,IWORD,LTEST(1),KTEST,LTYPE(1)          ANAC1
 604 FORMAT(7H0STUDY ,I2,2X,A8,2X,A10,2X,5HTEST ,I3,2X,A8,2X,5HTYPE ,      ANAC1
    2I3,*  INFLIGHT DATA FOR ANACOVA*)                                      ANAC1
     PRINT 602                                                              ANAC1
     K=0                                                                    ANAC1
     DO 715 L=1,3                                                           ANAC1
     J=K+1                                                                  ANAC1
     K=K+NOB(L)                                                             ANAC1
     PRINT 602                                                              ANAC1
 602 FORMAT(1H )                                                            ANAC1
     M=0                                                                    ANAC1
     DO 717 I=J,K                                                           ANAC1
     M=M+1                                                                  ANAC1
 717 PRINT 601,M,CHEM(I),TIME(I)                                            ANAC1
 715 CONTINUE                                                               ANAC1
 601 FORMAT(I4,F12.4,F5.0)                                                  ANAC1
     NT=3                                                                   ANAC1
     IOPT=2                                                                 ANAC1
     CALL ANACOVA(CHEM,TIME,LOBS,NT,NOB,TREAT,SL,SS,XMSC,F,PROBF,           ANAC1
    2     IOPT,XM,YM,SXX,SYY,SXY,NDFC)                                      ANAC1
     IF(IOPT.LT.0) PRINT 603                                                ANAC1
 603 FORMAT(@  ANACOVA  ERROR************@)                                 ANAC1
     J=1                                                                    ANAC1
     K=0                                                                    ANAC1
     DO 719 LAS=1,3                                                         ANAC1
     K=K+NOB(LAS)                                                           ANAC1
     L=0                                                                    ANAC1
     DO 718 I=J,K                                                           ANAC1
     L=L+1                                                                  ANAC1
     ZCH(2,L) =0.                                                           ANAC1
     ZCH(1,L)=CHEM(I)-(YM(LAS)+SL(LAS)*(TIME(I)-XM(LAS)))                   ANAC1
     CHEM(I)=ZCH(1,L)                                                       ANAC1
     WORK(1,L)=0.                                                           ANAC1
     WORK(2,L)=0.                                                           ANAC1
 718 CONTINUE                                                               ANAC1
     CALL LAGCOR(NOB(LAS),CHEM(J),NOB(LAS),CHEM(J),C,1,28)                  ANAC1
     PRINT 610,LAS                                                          ANAC1
 610 FORMAT(*0 MAN*,I3,*  LAG CORRELATIONS*/*0SEQ   C-VALUE*)               ANAC1
     PRINT 611,(I,C(I),I=1,28)                                              ANAC1
 611 FORMAT(I6,G15.6)                                                       ANAC1
     N=NOB(LAS)                                                             ANAC1
     CALL FOURG(ZCH,N,-1,WORK)                                              ANAC1
     DO 723 I=1,N                                                           ANAC1
     WORK(1,I)=ZCH(1,I)**2+ZCH(2,I)**2                                      ANAC1
 723 WORK(2,I)=ATAN2(ZCH(2,I),ZCH(1,I))                                     ANAC1
     PRINT 602                                                              ANAC1
     PRINT 607                                                              ANAC1
 607 FORMAT(1H0,T18,*FAST FOURIER TRANSFORMS*/* SEQ OMEGA*,                 ANAC1
    1        6X,@REAL         IMAGINARY        R**2+I**2      ARCTAN(I/R)@) ANAC1
     DO 720 M=1,N                                                           ANAC1
     QNM=FLOAT(N)/FLOAT(M-1)                                                ANAC1
     IF(M.EQ.1) QNM=0.                                                      ANAC1
     PRINT 606,M,QNM,ZCH(1,M),ZCH(2,M),WORK(1,M),WORK(2,M)                  ANAC1
 720 CONTINUE                                                               ANAC1
 606 FORMAT(1X,I3,F6.2,4G15.6)                                              ANAC1
     J=K+1                                                                  ANAC1
 719 CONTINUE                                                               ANAC1
 999 PRINT 1000,JOB(3)                                                      DEC10
     RETURN                                                                 DEC10
 200 FORMAT(10X,F12.4,2X,2A1)                                               STAT
 300 FORMAT(13H0GRAND MEAN =,F10.3,  8H     SD =,F10.3,7H     N =,I3)       STAT
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  400 FORMAT(I10,F12.4,2X,A4,2X,A2)                                       STAT
  900 FORMAT( 7HOMEAN =,F10.3,  8H    SD =,F10.3,7H    N =,I3//)           STAT
      END                                                                 ST
      SUBROUTINE MESIG(LTEXT,NFIRST,NLAST,SMEAN,SIGMA,NN)                 ME
      DIMENSION LTEXT(1)                                                  MESIG
      NN = 0                                                              MESIG
      SUM = 0.0                                                           MESIG
      SSQ = 0.0                                                           MESIG
      IF(NFIRST-NLAST) 10,10,90                                           APR24
   10 DO 140 I=NFIRST,NLAST                                               MESIG
      NSLOT = 1                                                           MESIG
      CALL OTEST(1,SUM,SSQ,NN,LTEXT)                                      MESIG
  140 CONTINUE                                                            MESIG
      IF(NN.EQ.0) GO TO 90                                                DEC10
      SMEAN = SUM/NN                                                      MESIG
      SIGMA=0.                                                            DEC10
      IF(NN.EQ.1) RETURN                                                  DEC10
      IF((NN*SSQ-SUM*SUM).LE.0.) RETURN                                   DEC10
      SIGMA = ((NN*SSQ - SUM*SUM)/(NN*(NN - 1)))**0.5                     MESIG
      RETURN                                                              MESIG
   90 SMEAN = 0.0                                                         MESIG
      SIGMA = 0.0                                                         MESIG
      RETURN                                                              MESIG
      END                                                                 MESIG
      SUBROUTINE OTEST(I,SUM,SSQ,NN,LTEXT)                                OTEST
      DIMENSION LTEXT(1)                                                  OTEST
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP          XREDUC
      DATA IZ/4H0.00/, ISS/4HSKIP/, INV/4HINVL/                           OTEST
      DATA IBLANK/4H    /                                                 JAN
      IF(XDATA(I)) 310,410,510                                            OTEST
  310 IXT = -XDATA(I) + 0.5                                               OTEST
      IF(IXT - 2) 315,312,315                                             OTEST
  312 LTEXT(I) = IZ                                                       OTEST
      NN = NN + 1                                                         OTEST
      RETURN                                                              OTEST
  315 LTEXT(I) = ISS                                                      OTEST
      RETURN                                                              OTEST
  410 LTEXT(I) = INV                                                      OTEST
      RETURN                                                              OTEST
  510 NN = NN + 1                                                         OTEST
      LTEXT(I) = IBLANK                                                   OTEST
      SUM = SUM + XDATA(I)                                                OTEST
      SSQ = SSQ + XDATA(I)*XDATA(I)                                       OTEST
      RETURN                                                              OTEST
      END                                                                 OTEST
      SUBROUTINE UERTST                                                   UERTST
      RETURN                                                              UERTST
      END                                                                 UERTST
      SUBROUTINE  STPLOT(LOOP,NOBST,NSLOT,IWORD,KSTUDY,KTYPE,KMAN,KTEST,STPLOT
     X SMEAN,SIGMA)                                                       STPLOT
      COMMON XDATA(150),T(200),IOPLOT,IFFF,KOT,KSKIP,LT,LM,LSTOP          XREDUC
      COMMON/HITBLK/LHIT(150),MDATE(150),ISAV (16),MTVOL(150)             XREDUC
      COMMON /HEADER/ LSTUDY(10),IS,LDATE(150),ID,LMAN(9),IM,JOB(16),     STPLOT
     .                LTYPE(20),ITP,LTEST(125),ITT,NSMF,NDATA             STPLOT
      DIMENSION YDATE(200),XP(3)                                          REDUCE
      COMMON/RG/ DATESC(3,5),IVV(4), SSMEAN(3), SSIGMA(3), NNN(3)         STPLOT
C     REAL*8 MSTUDY,MTYPE,MMAN,MTEST                                      STPLOT
      REAL   MSTUDY,MTYPE,MMAN,MTEST                                      STPLOT
      REAL KSTUDY, KTYPE, KMAN, KTEST, NITS                               STPLOT
      DIMENSION NSMAN(7)                                                  STPLOT
      EQUIVALENCE(YDATE,T)                                              STPLOT
      DATA NSMAN/4,9,8,0,1,2,3/                                         STPLOT
      IF(NOBST - 1) 911,911,1                                           STPLOT
    1 MFIRST = MDATE(1)                                                 STPLOT
      DO 10 II=1,NOBST                                                  STPLOT
      IF(MDATE(II) - MFIRST) 9,10,10                                    STPLOT
    9 MFIRST = MDATE(II)                                                STPLOT
   10 YDATE(II) = MDATE(II)                                             STPLOT
      J1 = NOBST + 1                                                    STPLOT
      J2 = NOBST + 2                                                    STPLOT
      CALL SCALE(XDATA, 3.0,NOBST,1)                                    STPLOT
C     XDATA(NOBST + 1) = 0.0                                            STPLOT
      IF(XDATA(J2)) 911,911,11                                          STPLOT
   11 IG = LSTUDY(1)                                                    STPLOT
      YDATE(NOBST + 1) = DATESC(1,IG)                                   STPLOT
      YDATE(NOBST + 2) = 24.0                                           STPLOT
      UP = (DATESC(2,IG) - DATESC(1,IG))/YDATE(NOBST + 2)               STPLOT
      DOWN=(DATESC(3,IG) - DATESC(1,IG))/YDATE(NOBST + 2)               STPLOT
      XP(1) = 0.1                                                       STPLOT
      XP(2) = 0.1+ UP                                                   STPLOT
      XP(3) = 0.1+ DOWN                                                 STPLOT
      NTIC = 3                                                          STPLOT
      CALL TEXT(LSTUDY(1), LTYPE(1), LMAN(1), LTEST(1),                 STPLOT
     X KSTUDY, KTYPE, KMAN, KTEST, NITS)                                STPLOT
      KS = KSKIP - KSKIP/3*3                                            STPLOT
      IF(KS) 208,108,208                                                STPLOT
C 108 CALL PLOT(4.25,10.5,-3)                                           STPLOT
  108 CALL PLOT(8.50,10.5,-3)                                           STPLOT
      FPN = LTYPE(1)                                                    STPLOT
      CALL SYMBOL(0.30,-.4,0.10,KSTUDY    , 0.0, 8)                     STPLOT
      CALL SYMBOL(1.20,-.4,0.10, KTEST    , 0.0, 8)                     STPLOT
      CALL SYMBOL(2.00,-.4,0.10,4HTYPE, 0.0, 4)                         STPLOT
      CALL NUMBER(2.40,-.4,0.10,FPN,0.0,-1)                             STPLOT
      CALL SYMBOL(2.60,-.4,0.10,IWORD,0.0,10)                           STPLOT
  208 CALL PLOT(0.0,-3.5,-3)                                            STPLOT
      CALL AXIS(0.0,0.0,12H JULIAN DATE,                                STPLOT
     1   -12, 4.0,00.0,YDATE(J1),YDATE(J2),-1,4,3)                      STPLOT
C     CALL AXIS (X,Y,BCD,NC,SIZE,THETA,YMIN,DY,NDEC,NLAB,NTIC)          STPLOT
C     CALL AXIS(0.0,0.0,16H       DATA VALUE,16,3.0,  90.0, Y(J1),Y(J2))STPLOT
      CALL AXIS(0.0,0.0,NITS    , 8,3.0,  90.0, XDATA(J1),              STPLOT
     1 XDATA(J2), -1,  4, 1)                                            STPLOT
      FPN = LMAN(1)                                                     STPLOT
      CALL SYMBOL(0.10,3.01,0.07,KMAN, 0.0, 3)                          STPLOT
      DO 308 JJ=1,3                                                     STPLOT
      KG = 4 - JJ                                                       STPLOT
      CALL NUMBER(XP(KG), 2.89, 0.07, SSMEAN(KG), 0.0, 2)               STPLOT
  308 CALL NUMBER(XP(KG), 2.77, 0.07, SSIGMA(KG), 0.0, 2)               STPLOT
      CALL PLOT(UP,0.0,3)                                               STPLOT
      CALL PLOT(UP,3.0,2)                                               STPLOT
      CALL PLOT(DOWN,3.0,3)                                             STPLOT
      CALL PLOT(DOWN,0.0,2)                                             STPLOT
  708 LL = NSMAN(LMAN(1))                                               STPLOT
      CALL LINE(YDATE,XDATA,NOBST,1, 0,LL)                              STPLOT
  811 CONTINUE                                                          STPLOT
      KSKIP = KSKIP + 1                                                 STPLOT
  911 RETURN                                                            STPLOT
      END                                                               STPLOT
      SUBROUTINE TEXT(LSTUDY,LTYPE,LMAN,LTEST,NSTUDY,NTYPE,NMAN,NTEST,  TEXT
     1 NITS)                                                            TEXT
C     REAL*8 KSTUDY,MSTUDY(6),KTEST,MURN(124),MBLD(24),MITS(124),       TEXT
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 REAL    KSTUDY,MSTUDY(5),KTEST,MURN(124),MBLU(24),MITS(124),            TEXT
1MITSP(24),KTYPE,MTYPE(15),MM,KITS                                       TEXT
 REAL NSTUDY, NTYPE, NMAN, NTEST, KMAN, MMAN(9), NITS                    TEX
 DATA MSTUDY/8HSMEAT    ,8HSKYLAB 2,8HSKYLAB 3,8HSKYLAB 4,8HAPOLLO17TEX
1/                                                                        TEXT
 DATA MMAN/4HCDR ,4HPLT ,4HSPT ,4HC1  ,4HC2  ,4HC3  ,4HC4  ,              TEXT
X4HC5  ,4HC6  /                                                           TEXT
 DATA (MURN(I),I=1,107)                                                   TEXT
X           /8HEPI      ,8HNOREPI   ,8HADH      ,8HHYDRO    ,8HALDO     ,TEXT
X8H17OH     ,8HOSMO     ,8HNA       ,8HK        ,8HMG       ,8HPO4      ,TEXT
X8HCA       ,8HCL       ,8HP        ,8HSP.GR.   ,8HCREAT    ,8HURICACID,TEXT
X8HB        ,8HSI       ,8HFE       ,8HAL       ,8HMO       ,8HCU       ,TEXT
X8HZN       ,8HTI       ,8HNI       ,8HSR       ,8HCR       ,8HBL       ,TEXT
X8HMN       ,8HLI       ,8HRB       ,8HPD       ,8HAND      ,8HETIO     ,TEXT
X8HUREA     ,8H11=0 AND,8H11=0ETIO,8H11OH AND,8H11OHETIO,8HTOTAL    ,TEXT
X8HLYS      ,8HHIS      ,8HNH3      ,8HARG      ,8HHYP      ,8HASP      ,TEXT
X8HTHR      ,8HSER      ,8HGLU      ,8HPRO      ,8HGLY      ,8HALA      ,TEXT
X8HCYS/2    ,8HVAL      ,8HMET      ,8HILE      ,8HLEU      ,8HTYR      ,TEXT
X8HPHE      ,8HHLYS     ,8HGAMMA-AB,8HORN      ,8HETH      ,8HNH3      ,TEXT
X8HLYS      ,8H1-CH3HIS,8HHIS      ,8H3-CH3HIS,8HANS      ,8HTRY      ,TEXT
X8HCRE      ,8HCAR      ,8HARG      ,8HPSER     ,8HPETN     ,8HTYR      ,TEXT
X8HUREA     ,8HHYP      ,8HASP      ,8HTHR      ,8HSER      ,8HASP NH2  ,TEXT
X8HGLU NN2  ,8HSAR      ,8HPRO      ,8HGLU      ,8HCIT      ,8HGLC NH2  ,TEXT
X8HGLY      ,8HALA      ,8HALPHA-AA,8HALPHA-AB,8HVAL      ,8HCYS/2    ,TEXT
X8HCYT      ,8HMET      ,8HILE      ,8HLEU      ,8HTYR      ,8HPHE      ,TEXT
X8HB-ALA    ,8HB-AIB    ,8H5HIAA    ,8H         ,8H         ,8H         /JAN25
 DATA (MURN(I),I=108,124)/                                                TEXT
X8H         ,8H         ,8H         ,8H         ,8H         ,8H         ,TEXT
X8H         ,8H         ,8HCALORIES,8HPROTEIN  ,8HDIET CA  ,8HDIET P   ,TEX
X8HDIET NA  ,8HDIET MG  ,8HDIET K   ,8HDIET H20,8HWEIGHT   /             TEX
 DATA MBLU /8HHYDRO     ,8HALDO     ,8HHGH      ,8HANGIO    ,8HINSULIN  ,TEXT
X8HT4       ,8HACTH     ,8HADH      ,8HPTH      ,8HCAL      ,8HVIT.D.   ,TEXT
X8HTSH      ,8HOSMO     ,8HNA       ,8HK        ,8HMG       ,8HPO4      ,TEXT
X8HCA       ,8HCL       ,8HGLU      ,8HTP       ,8HTESTOS   ,8H         ,JAN25
X8H         /                                                             TEXT
 DATA (MITS(I),I=1,107)                                                   TEXT
X           /8HUG/TV    ,8HUG/TV    ,8HMU/TV    ,8HUG/TV    ,8HUG/TV    ,TEXT
X8HMG/TV    ,8HMOSM/TV ,8HMEQ/TV   ,8HMEQ/TV   ,8HMEQ/TV   ,8HMG/TV    ,TEXT
X8HMEQ/TV   ,8HMEQ/TV   ,8HMLO      ,8H         ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,TEXT
X8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,TEXT
X8HUG/ML    ,8HUG/ML    ,8HUG/ML    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HTMG/TV   ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMMG/TV   ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMMG/TV   ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMMG/TV   ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,TEXT
X8HMG/TV    ,8HMG/TV    ,8HMG/TV    ,8H         ,8H         ,8H         /JAN25
 DATA (MITS(I),I=108,124)/                                                TEX
X8H         ,8H         ,8H         ,8H         ,8H         ,8H         ,TEX
X8H         ,8H         ,8HKCAL     ,8HGRAMS    ,8HMG       ,8HMG       ,TEX,
X8HMG       ,8HMG       ,8HMG       ,8HML       ,8HLBS.     /             TEXT
 DATA MITSB/8HUG/100ML,8HPG/ML    ,8HNG/ML    ,8HMUG/ML/H,8HUU/ML    ,TEXT
X8HUG/100ML,8H         ,8H         ,8HPG/ML    ,8HPG/ML    ,8HNG/ML    ,TEXT
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     X8H        ,8HMOSM/L  ,8HNEQ/L   ,8HNEQ/L   ,8HMG PC   ,8HMG PC   ,JAN25
     X8HMG PC   ,8HMG PC   ,8HMG PC   ,8HMG PC   ,8HUG/TV   ,8H        ,JAN25
     X8H        /                                                       TEXT
      NSTUDY = MSTUDY(LSTUDY)                                           TEXT
      NMAN = MMAN(LMAN)                                                 TEXT
      IF(LTEST - 400) 10,20,20                                          TEXT
   10 KTEST = MBLD(LTEST - 299)                                         TEXT
      KITS = MITSB(LTEST-299)                                           TEXT
      GO TO 30                                                          TEXT
   20 KTEST = MURN(LTEST - 399)                                         TEXT
      KITS = MITS(LTEST-399)                                            TEXT
   30 NTEST = KTEST                                                     TEXT
      NITS = KITS                                                       TEXT
      RETURN                                                            TEXT
      END                                                               TEXT
      SUBROUTINE KRUSWAL(XIN,ID1,ID2IN,N,NCEN,JOP,K,NU,NC,IP2)          SETWRK
C    THIS PROGRAM CALCULATES  A  GENERALIZED KRUSKAL-WALLIS K-SAMPLE    KRUSWAL
C    TEST. WHEN K=2, THE TEST IS EQUAL TO GEHAN@S GENERALIZED WILCOXON  KRUSWAL
C    TEST. CALCULATIONS FOLLOW THE PROCEDURES GIVEN BY MANTEL (BIOMETRICKRUSWAL
C    MARCH 1967)                                                        KRUSWAL
C                                                                       KRUSWAL
C    IN CASE OF TWO-SAMPLE, IF THE SAMPLE SIZES ARE DIFFERENT, IT IS    KRUSWAL
C    SUGGESTED TO NAME THE ONE WITH LESS OBSERVATIONS SAMPLE 1.         KRUSWAL
C     CALL NKRUSWAL(X,ID1,ID2,NALL,NC,JOP,NCOND,NUNCEN,NCEN)            KRUSWAL
C                                                                       KRUSWAL
C     X(I),I=1,NALL    ARRAY CONTAINING ALL OBS IN THE SAMPLES          KRUSWAL
C      ID1(I)=1         ITH OBS IS UNCENSORED                           KRUSWAL
C            =0         ITH OBS IS CENSORED                             KRUSWAL
C      ID2(I)=J         ITH OBS IS FROM JTH SAMPLE                      KRUSWAL
C      NALL             TOTAL NO OF OBS                                 KRUSWAL
C      NC               TOTAL NO OF CENSORED OBS                        KRUSWAL
C      JOP=1            PRINT INFO                                      KRUSWAL
C         =0            DO NOT PRINT                                    KRUSWAL
C      NCOND            NO OF SAMPLES                                   KRUSWAL
C      NUNCEN(I)        NO OF UNCENSORED OBS IN SAMPLE I                KRUSWAL
C      NCEN(I)          NO OF CENSORED OBS IN SAMPLE I                  KRUSWAL
      DIMENSION XIN(1),ID1(1),ID2IN(1),NU(6),NC(6),XY(120),ID2(120)     SETWRK
      DIMENSION R1( 600),R2( 600)                                       KRUSWAL
C                                                                       KRUSWAL
C    MAXIMUM NO. OF SAMPLES = 6.                                        KRUSWAL
C    TOTAL NUMBER OF OBSERVATIONS ALLOWED = 600.                        KRUSWAL
C    K = NO. OF SAMPLES                                                 KRUSWAL
C                                                                       KRUSWAL
C     MOVE INCOMMING ARRAYS TO WORK ARRAYS                              SETWRK
      DO 10 I=1,N                                                       SETWRK
      XY(I)=XIN(I)                                                      SETWRK
      ID2(I)=ID2IN(I)                                                   SETWRK
   10 CONTINUE                                                          SETWRK
C                                                                       KRUSWAL
C    ORDER OBS. IN ASCENDING ORDER                                      KRUSWAL
C                                                                       KRUSWAL
      CALL SORT2(XY,N,ID1,ID2)                                          KRUSWAL
C    COMPUTATION OF R1                                                  KRUSWAL
C       STEPS 1 AND 2 : RANK FROM LEFT TO RIGHT, OMITTING RIGHT CENSOREDKRUSWAL
C                       VALUES. ASSIGN NEXT HIGHER RANK TO RIGHT        KRUSWAL
C                       CENSORED VALUES                                 KRUSWAL
C                                                                       KRUSWAL
      IRANK=0                                                           KRUSWAL
      DO 90I=1,N                                                        KRUSWAL
      IF (ID1(I).EQ.0) GO TO 101                                        KRUSWAL
      IRANK=IRANK+1                                                     KRUSWAL
      R1(I)=IRANK                                                       KRUSWAL
      GO TO 90                                                          KRUSWAL
  101 R1(I)=IRANK+1                                                     KRUSWAL
   90 CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C        STEP 3 : REDUCE  THE RANK OF TIED OBSERVATIONS TO THE LOWEST   KRUSWAL
C                 RANK FOR THE VALUE                                    KRUSWAL
C                                                                       KRUSWAL
      K1=N-1                                                            KRUSWAL
      L1=1                                                              KRUSWAL
  12  IF (XY(L1).NE.XY(L1+1)) GO TO 11                                  KRUSWAL
      JEMP=ID1(L1)*ID1(L1+1)                                            KRUSWAL
      IF(JEMP .EQ. 0) GO TO 11                                          KRUSWAL
      R1(L1+1)=R1(L1)                                                   KRUSWAL
      IF (L1.EQ.K1) GO TO 13                                            KRUSWAL
      L1=L1+1                                                           KRUSWAL
      GO TO 12                                                          KRUSWAL
  11  IF (L1.EQ.K1) GO TO 13                                            KRUSWAL
      L1=L1+1                                                           KRUSWAL
      GO TO 12                                                          KRUSWAL
  13  CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C    COMPUTATION OF R2                                                  KRUSWAL
C       STEP 1 : RANK FROM RIGHT TO LEFT                                KRUSWAL
C                                                                       KRUSWAL
      DO 14 I=1,N                                                       KRUSWAL
  14  R2(I)=N-I+1                                                       KRUSWAL
C                                                                       KRUSWAL
C        STEP 2 : REDUCE THE RANK OF TIED OBSERVATIONS TO THE LOWEST RANKKRUSWAL
C                 FOR THE VALUE                                         KRUSWAL
C                                                                       KRUSWAL
      L1=N                                                              KRUSWAL
  22  IF (XY(L1).NE.XY(L1-1)) GO TO 21                                  KRUSWAL
      JEMP=ID1(L1)*ID1(L1-1)                                            KRUSWAL
      IF (JEMP .EQ. 0) GO TO 21                                         KRUSWAL
      R2(L1-1)=R2(L1)                                                   KRUSWAL
      IF (L1.EQ. 2) GO TO 23                                            KRUSWAL
      L1=L1-1                                                           KRUSWAL
      GO TO 22                                                          KRUSWAL
  21  IF (L1.EQ. 2) GO TO 23                                            KRUSWAL
      L1=L1-1                                                           KRUSWAL
      GO TO 22                                                          KRUSWAL
  23  CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C        STEP 3 : REDUCE THE RANK OF RIGHT CENSORED OBSERVATIONS TO UNITYKRUSWAL
C                                                                       KRUSWAL
      IF (NCEN .EQ. 0) GO TO 501                                        KRUSWAL
      DO 24 I=1,N                                                       KRUSWAL
      IF (ID1(I) .EQ. 1) GO TO 24                                       KRUSWAL
      R2(I)=1.                                                          KRUSWAL
  24  CONTINUE                                                          KRUSWAL
C                                                                       KRUSWAL
C    COMPUTE FINAL SCORES -R1(I)                                        KRUSWAL
C                                                                       KRUSWAL
  501 CONTINUE                                                          KRUSWAL
      DO 25 I=1,N                                                       KRUSWAL
  25  R1(I)=R1(I)-R2(I)                                                 KRUSWAL
      IF(JOP.NE.1) GO TO 37                                             KRUSWAL
      PRINT 30                                                          KRUSWAL
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 30   FORMAT(1H0,8X,@I@,8X,@OBSERVATIONS@,8X,@SAMPLE@,8X,@SCORES@)         KRUSWAL
      DO 31 I=1,N                                                          KRUSWAL
      IF (ID1(I).EQ.0) GO TO 34                                            KRUSWAL
      PRINT 33, I,XY(I),ID2(I),R1(I)                                       KRUSWAL
      GO TO 31                                                             KRUSWAL
   34 PRINT 35, I,XY(I),ID2(I),R1(I)                                       KRUSWAL
 33   FORMAT(1H ,6X,I3,7X,F8.1,15X,I2,12X,F6.0)                            KRUSWAL
 35   FORMAT(1H ,6X,I3,7X,F8.1,1H+,14X,I2,12X,F6.0)                        KRUSWAL
 31   CONTINUE                                                             KRUSWAL
   37 PRINT 36                                                             KRUSWAL
 36   FORMAT(1H0)                                                          KRUSWAL
      IF (K.GT.2) GO TO 200                                                KRUSWAL
      CALL TWOSPL(R1,ID2,N,NU,NC,IP2)                                      FIX2
      GO TO 1000                                                           KRUSWAL
 200  CALL AKSPL(K,N,R1,NU,NC,ID2)                                         KRUSWAL
 1000 CONTINUE                                                             KRUSWAL
      RETURN                                                               KRUSWAL
      END                                                                  KRUSWAL
      SUBROUTINE SORT2(X,N,ID,IC)                                          SORT2
      DIMENSION X(1),ID(1),IC(1)                                           SORT2
      DO 1 I=1,N                                                           SORT2
      J=N-I+1                                                              SORT2
      JJ=J-1                                                               SORT2
      IF (JJ .LT. 1)GO TO 1                                                SORT2
      DO 2 K=1,JJ                                                          SORT2
      IF (X(K).NE.X(J)) GO TO 3                                            SORT2
      IF (ID(K)-ID(J)) 4,2,2                                               SORT2
 3    IF (X(K) .LT. X(J)) GO TO 2                                          SORT2
 4    X1=X(J)                                                              SORT2
      ITEM=ID(J)                                                           SORT2
      ICTE=IC(J)                                                           SORT2
      X(J)=X(K)                                                            SORT2
      ID(J)=ID(K)                                                          SORT2
      IC(J)=IC(K)                                                          SORT2
      X(K)=X1                                                              SORT2
      ID(K)=ITEM                                                           SORT2
      IC(K)=ICTE                                                           SORT2
 2    CONTINUE                                                             SORT2
 1    CONTINUE                                                             SORT2
      RETURN                                                               SORT2
      END                                                                  SORT2
      SUBROUTINE TWOSPL(R1,ID2,N,NU,NC,IP2)                                FIX2
      DIMENSION ID2(1),R1(1),NU(1),NC(1)                                   TWOSPL
C     DATA ONE,TWO/@ONE@,@TWO@/                                            TWOSPL
      DATA ONE/10HONE       /                                              TWOSPL
      DATA TWO/10HTWO       /                                              TWOSPL
      WW=0.                                                                TWOSPL
      DO 26 I=1,N                                                          TWOSPL
      IF(ID2(I).EQ.IP2) GO TO 26                                           FIX2
      WW=WW+R1(I)                                                          TWOSPL
 26   CONTINUE                                                             TWOSPL
      SUM=0.                                                               TWOSPL
      DO 27 I=1,N                                                          TWOSPL
 27   SUM=SUM+R1(I)**2                                                     TWOSPL
      XN1=NU(1)+NC(1)                                                      TWOSPL
      XN2=NU(2)+NC(2)                                                      TWOSPL
      XN=N                                                                 TWOSPL
      VAR=XN1*XN2*SUM/(XN*(XN-1.))                                         TWOSPL
      VAR=SQRT(VAR)                                                        TWOSPL
C                                                                          TWOSPL
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C     CALCULATE CONTINUITY CORRECTION                                   TWOSPL
C                                                                       TWOSPL
      SIGN=-1.                                                          TWOSPL
      IF (WW.LT.0.) SIGN=1.                                             TWOSPL
      COR=.5                                                            TWOSPL
      IF (FLOAT((NC(1)+NC(2))/N) .LT. 0.2) COR=1.0                      TWOSPL
      COR=SIGN*COR                                                      TWOSPL
      IF (WW.EQ.0.) COR=0.                                              TWOSPL
C                                                                       TWOSPL
C     CALCULATE FINAL W SCORE AND PROBABILITY.                          TWOSPL
C                                                                       TWOSPL
      WSCORE=(WW+COR)/VAR                                               TWOSPL
      WSC=WSCORE                                                        TWOSPL
      IF (ABS(WSCORE)-3.1) 305,305,302                                  TWOSPL
 305  P1=100.*(1.-PROB(WSC))                                            TWOSPL
      GO TO 301                                                         TWOSPL
 302  P1=0.1                                                            TWOSPL
 301  CONTINUE                                                          TWOSPL
      P2=P1*2.                                                          TWOSPL
      P2=AMIN1(P2,100.)                                                 TWOSPL
      PRINT 600, WW,VAR,WSCORE                                          TWOSPL
 600  FORMAT(1H0,3X,1HW,7X,8HST. DEV.,3X,10HASYMPTOTIC/25X,6HWSCORE/1X,FTWOSPL
     19.0,F8.2,7X,F5.2)                                                 DEC10
      PRINT 601, WSCORE,P2,TWO                                          TWOSPL
      PRINT 601, WSCORE,P1,ONE                                          TWOSPL
 601  FORMAT(1X,F5.2,1X,@IS SIGNIFICANT AT THE @, F7.1,@ PERCENT LEVEL -TWOSPL
     1@,A3,@ TAILED TEST@)                                              TWOSPL
      PRINT 602                                                         TWOSPL
  602 FORMAT(1H0)                                                       TWOSPL
      RETURN                                                            TWOSPL
      END                                                               TWOSPL
      SUBROUTINE AKSPL(K,N,R1,NU,NC,ID2)                                AKSPL
      DIMENSION R1(1),NU(1),NC(1),W(6),ID2(1)                           AKSPL
C                                                                       AKSPL
C     TEST STATISTIC FOR K(GREATER THAN 2)-SAMPLE CASE                  AKSPL
C                                                                       AKSPL
      DO 201 I=1,K                                                      AKSPL
 201  W(I)=0.                                                           AKSPL
      DO 202 IJ=1,N                                                     AKSPL
      I=ID2(IJ)                                                         AKSPL
 202  W(I)=W(I)+R1(IJ)                                                  AKSPL
      T=0.                                                              AKSPL
      DO 203 IJ=1,N                                                     AKSPL
 203  T=T+R1(IJ)**2                                                     AKSPL
      B=0.                                                              AKSPL
      PRINT 300                                                         AKSPL
 300  FORMAT(1H0,@SAMPLE@,8X,@W(I)@,10X,@N(I)@)                         AKSPL
      DO 204 I=1,K                                                      AKSPL
      UC=NU(I)+NC(I)                                                    AKSPL
      PRINT 301, I,W(I),UC                                              AKSPL
 301  FORMAT(1H ,3X,I1,7X,F8.0,7X,F5.0)                                 AKSPL
 204  B=B+(W(I)**2/UC)                                                  AKSPL
      PRINT 302, B,T                                                    AKSPL
 302  FORMAT(1H0,@B =@,F12.2,5X,@T =@,F10.0)                            AKSPL
      WSCORE=(B/T)*FLOAT(N-1)                                           AKSPL
C                                                                       AKSPL
C     WSCORE HAS CHI-SQUARE DISTRIBUTION WITH (K-1) D. F.               AKSPL
C                                                                       AKSPL
      WS=WSCORE                                                         AKSPL
      XK=K-1                                                            AKSPL
      XM=WS/2.                                                          AKSPL
      IC=XK/2.                                                          AKSPL
      SWS=SQRT(WS)                                                      AKSPL
      EM=1./EXP(XM)                                                     AKSPL
      PRINT 205, WSCORE                                                 AKSPL
 205  FORMAT(1H0,@WSCORE = @,F7.3)                                      AKSPL
      XK2=XK/2.                                                         AKSPL
      IF ((XK2-FLOAT(IC)).NE.0) GO TO 500                               AKSPL
      SUM=0.                                                            AKSPL
      PROD=1.                                                           AKSPL
      DO 1 I=1,IC                                                       AKSPL
      IF (I.GT.1) GO TO 2                                               AKSPL
      XI=1                                                              AKSPL
      GO TO 3                                                           AKSPL
 2    XI=I-1                                                            AKSPL
 3    PROD=XI*PROD                                                      AKSPL
      TERM=XM**(I-1)/PROD                                               AKSPL
 1    SUM=SUM+TERM                                                      AKSPL
      CPROB=SUM*EM                                                      AKSPL
      P=100.*CPROB                                                      AKSPL
      IF (P.LT.0.1000) GO To 10                                         AKSPL
      PRINT 206, WSCORE,P                                               AKSPL
 206  FORMAT(1H0,F7.3,@ IS SIGNIFICANT AT THE @,F5.1,@ PERCENT LEVEL@)  AKSPL
      GO TO 1000                                                        AKSPL
 10   P=0.10                                                            AKSPL
      PRINT 12, WSCORE,P                                                AKSPL
 12   FORMAT(1H0,F7.3,@ IS SIGNIFICANT WITH PROBABILITY LESS THAN @,F7.3AKSPL
     1,@ PERCENT LEVEL@)                                                AKSPL
      GO TO 1000                                                        AKSPL
 500  GAMH=1.7724538509                                                 AKSPL
      TERM=SQRT(XM)/(0.5*GAMH)                                          AKSPL
      SUM=TERM                                                          AKSPL
      NR=(XK-3.)/2.                                                     AKSPL
      IF(NR.EQ.0) GO TO 502                                             AKSPL
      DO 501 I=1,NR                                                     AKSPL
      XI=I                                                              AKSPL
      TERM=TERM*2.*XM/(2.*XI+1.)                                        AKSPL
 501  SUM=SUM+TERM                                                      AKSPL
 502  CHISQ=(SUM*EM)*100.                                               AKSPL
      P2=100.*2.*(1.-PROB(SWS))                                         AKSPL
      P=P2+CHISQ                                                        AKSPL
      IF (P.LT.0.0005) GO To 14                                         AKSPL
      PRINT 206,  WSCORE,P                                              AKSPL
      GO TO 1000                                                        AKSPL
 14   P=0.001                                                           AKSPL
      PRINT 12,  WSCORE,P                                               AKSPL
 1000 CONTINUE                                                          AKSPL
      RETURN                                                            AKSPL
      END                                                               AKSPL
      FUNCTION PROB(X)                                                  PROB
C                                                                       PROB
C       THIS FUNCTION ROUTINE COMPUTES                                  PROB
C                      DISTRIBUTION FUNCTION(X)        IF X GE 0        PROB
                   1 - DISTRIBUTION FUNCTION(X)        IF X LT 0        PROB
C       OF A ST. NORMAL VARIABLE USING APPROXIMATION 26.2.19  P.932     PROB
C       HANDBOOK OF MATH. FUNCTIONS                                     PROB
      DATA D1,D2,D3,D4,D5,D6/.0498673470,.0211410061,.0032776263,.000038PROB
     10036,.0000488906,.0000053830/                                     PROB
      IF (X) 20,30,40                                                   PROB
 30   PROB=0.5                                                          PROB
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      RETURN                                                            PROB
   20 X1=-X                                                             PROB
      GO TO 50                                                          PROB
   40 X1=X                                                              PROB
   50 A=1.+X1*(D1+X1*(D2+X1*(D3+X1*(D4+X1*(D5+X1*D6)))))                PROB
      PROB=1.-0.5*A**(-16)                                              PROB
   60 CONTINUE                                                          PROB
      RETURN                                                            PROB
      END                                                               PROB
      SUBROUTINE FFOUT(S1, S2, N1, N2,FDAT, PRB)                        FFOUT
      FDAT = (S1/N1)/(S2/N2)                                            FFOUT
      PRB= FISH(FDAT,N1,N2)                                             FFOUT
      PRB = (1.0 - PRB)*100.                                            FFOUT
      IF(PRB - 0.1) 1,2,2                                               FFOUT
    1 PRB = 0.1                                                         FFOUT
    2 RETURN                                                            FFOUT
      END                                                               FFOUT
      FUNCTION FISH(F,N1,N2)                                            FISH
      LOGICAL E1,E2,E3                                                  FISH
       IF(N1.GE.100.AND.N2.GE.100) GOTO 9                               FISH
C-----------------------------------------------------------------------FISH
C     INITIALIZATION AND SETTING OF LOGICAL SWITCHES  TO .TRUE. IF      FISH
C     THE DEGREES OF FREEDOM ARE EVEN                                   FISH
C-----------------------------------------------------------------------FISH
      E1=.FALSE.                                                        FISH
      E2=.FALSE.                                                        FISH
      E3=.FALSE.                                                        FISH
      IF(MOD(N1,2).EQ.0) E1=.TRUE.                                      FISH
      IF(MOD(N2,2).EQ.0) E2=.TRUE.                                      FISH
      X=N2/(N2+N1*F)                                                    FISH
      IF(.NOT.(E1.OR.E2)) GO TO 5                                       FISH
      IF(E1.AND..NOT.E2) GO TO 1                                        FISH
      IF(.NOT.E1.AND.E2) GO TO 2                                        FISH
      IF(N1.LE.N2) GO TO 1                                              FISH
C-----------------------------------------------------------------------FISH
C   INITIALIZATION FOR SECOND DEGREE OF FREEDOM EVEN  AND LESS THAN     FISH
C      FIRST DEGREE OF FREEDOM IF IT TOO IS EVEN                        FISH
C-----------------------------------------------------------------------FISH
    2 I=N1                                                              FISH
      N1=N2                                                             FISH
      N2=I                                                              FISH
      X=1.0-X                                                           FISH
      E3=.TRUE.                                                         FISH
C-----------------------------------------------------------------------FISH
C     INITIALIZATION FOR FIRST DEGREE OF FREEDOM EVEN AND LESS THAN     FISH
C   SECOND DEGREE OF FREEDOM IF IT IS EVEN                              FISH
C-----------------------------------------------------------------------FISH
    1 Y=1.0-X                                                           FISH
C-----------------------------------------------------------------------FISH
C     CALCULATION OF PROBABILITY FOR AT LEAST ONE DEGREE OF FREEDOM EVENFISH
C-----------------------------------------------------------------------FISH
      FISH=0.0                                                          FISH
      H=SQRT(X**N2)                                                     FISH
      M=N1/2-1                                                          FISH
      MCDC = M + 1                                                      FISH
      DO 3 ICDC=1,MCDC                                                  FISH
      I = ICDC - 1                                                      FISH
      FISH=FISH+H                                                       FISH
    3 H=(H*Y*(N2+2.*I))/(2.*(I+1.))                                     FISH
      IF(E3) GO TO 4                                                    FISH
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C-----------------------------------------------------------------------FISH
C        ADJUST CALCULATED PROBABILITY IF ITS ONES COMPLEMENT WAS       FISH
C     CALCULATED ORIGINALLY                                             FISH
C-----------------------------------------------------------------------FISH
      FISH=1.0-FISH                                                     FISH
      RETURN                                                            FISH
    4 I=N1                                                              FISH
      N1=N2                                                             FISH
      N2=I                                                              FISH
      RETURN                                                            FISH
C-----------------------------------------------------------------------FISH
C     CALCULATION OF THE PROBABILITY FOR BOTH DEGREES OF FREEDOM ODD    FISH
C-----------------------------------------------------------------------FISH
    5 Y=1.0-X                                                           FISH
      H=.63661977*SQRT(X*Y)                                             FISH
      FISH=.63661977*ACOS(SQRT(X))                                      FISH
      IF(N2.EQ.1) GO TO 8                                               FISH
      M=N2-2                                                            FISH
      DO  6  I=1,M,2                                                    FISH
      FISH=FISH+H                                                       FISH
    6 H=H*X*(I+1)/(I+2)                                                 FISH
    8 IF(N1.EQ.1) RETURN                                                FISH
      H=H*N2                                                            FISH
      M=N1-2                                                            FISH
      DO  7  I=1,M,2                                                    FISH
      FISH=FISH-H                                                       FISH
    7 H=H*Y*(N2+I)/(I+2)                                                FISH
      RETURN                                                            FISH
    9  D1=N1                                                            FISH
       D2=N2                                                            FISH
       DT=(D1/D2)*F                                                     FISH
       DN=SQRT((2.*D2-1.)*DT)-SQRT(2.*D1-1.)                            FISH
       X=DN/SQRT(1.+DT)                                                 FISH
       FISH=PHI(X)                                                      FISH
       RETURN                                                           FISH
      END                                                               FISH
      REAL FUNCTION PHI(X)                                              PHI
C-----------------------------------------------------------------------PHI
C                                                                       PHI
C  PHI CALCULATES THE AREA UNDER THE NORMAL CURVE                       PHI
C  A TRANSFORMATION AND J-FRACTION ARE USED ( SEE METHOD )              PHI
C                                                                       PHI
C-----------------------------------------------------------------------PHI
      LOGICAL UPPER                                                     PHI
      IF(X.LT.-13.27) GO TO 6                                           PHI
      IF(X.GT.8.5) GO TO 8                                              PHI
      IF(X.NE.0.0) GO TO 2                                              PHI
      PHI=0.50                                                          PHI
      RETURN                                                            PHI
    2 UPPER=X.GT.0.0                                                    PHI
      Z=    (ABS(X))                                                    PHI
      Y= 5.6418953027302E-1* EXP(- Z*Z /2.E0)                           PHI
      Z = Z /1.41421356237310E0                                         PHI
      T=0.0E0                                                           PHI
      IF( ABS(Y/Z).GT.0.0) T=Y/(Z-6.9183675618730E-6                    PHI
     1+5.0025350900390E-1/(Z+1.2386797611409E-2+7.7267300865878E-1      PHI
     2/(Z-4.3263982143053E0 +7.3456287718055E1/(Z+1.5040871364290E1     PHI
     3+6.2086245657235 6E0 /(Z+8.8971612130791E0 +4.9182171845874E1     PHI
     4/(Z-2.5108230069509E0 -2.8225972942737E0/(Z-9.7597917308472E-1    PHI
     5+2.4244213526837E1 /(Z+4.8008570125081E0 +4.9227853919002E-1      PHI
     6/(Z+7.6621170927681E0 +5.0285619125788E1/(Z-4.6529284984655E0     PHI
     7  ))))))))))                                                       PHI
      T=T/2.E0                                                           PHI
      IF(UPPER) GO TO 4                                                  PHI
      PHI=T                                                              PHI
      RETURN                                                             PHI
    4 PHI=1.0E0-T                                                        PHI
      RETURN                                                             PHI
    6 PHI = 0.0                                                          PHI
      RETURN                                                             PHI
    8 PHI = 1.0                                                          PHI
      RETURN                                                             PHI
      END                                                                PHI
      SUBROUTINE ERROR                                                   PHI
      COMMON /SISBUF/ IBUF(35),IUR(125),IBL(35),IBUFF(30),KEE,KEF,       ERROR
     +                MFUNC,IFILE,IERR                                   ERROR
      COMMON /FF/ FITRA1(35),FITRA2(35),FITRA3(35),FITRA4(35)            ERROR
      GO TO(100,200,300,400) IFILE                                       ERROR
  100 IERR = IFETCH(FITRA1,3LIRS)                                        ERROR
      CALL STOREF(FITRA1,3LIRS,0)                                        ERROR
      GO TO 500                                                          ERROR
  200 IERR = IFETCH(FITRA2,3LIRS)                                        ERROR
      CALL STOREF(FITRA2;3LIRS,0)                                        ERROR
      GO TO 500                                                          ERROR
  300 IERR = IFETCH(FITRA3,3LIRS)                                        ERROR
      CALL STOREF(FITRA3,3LIRS,0)                                        ERROR
      GO TO 500                                                          ERROR
  400 IERR = IFETCH(FITRA4,3LIRS)                                        ERROR
      CALL STOREF(FITRA4,3LIRS,0)                                        ERROR
  500 IF(IERR.EQ.0) RETURN                                               ERROR
      PRINT 601,IFILE,IERR,KEE,KEF                                       ERROR
      RETURN                                                             ERROR
  601 FORMAT(* RA*,I1,* ERROR *,O10,2I10)                                ERROR
      END                                                                ERROR
      SUBROUTINE ANACOVA(Y,X,L ,NT,NOB,TREAT,SL,SS,XMS,F,PROBF,IOPT,     ERROR
     Z            XM,YM,SXX,SYY,SXY,NDF)                                 ANACOVA
      DIMENSION Y(2),X(2),NOB(2),YM(2),XM(2),SL(2),SS(2),XMS(2),F(2),    ANACOVA
     2         PROBF(2),SXX(2),SYY(2),SXY(2),TREAT(2),NDF(2)             ANACOVA
      SS(1)=0                                                            ANACOVA
      SS(9)=0                                                            ANACOVA
      NTT=NT+1                                                           ANACOVA
      NT2=NT+2                                                           ANACOVA
      NT3=NT+3                                                           ANACOVA
      SS(12)=0                                                           ANACOVA
      L=0                                                                ANACOVA
      DO 9 I=1,NT3                                                       ANACOVA
      SXX(I)=0                                                           ANACOVA
      SYY(I)=0                                                           ANACOVA
      SXY(I)=0                                                           ANACOVA
      XM(I)=0                                                            ANACOVA
      YM(I)=0                                                            ANACOVA
    9 CONTINUE                                                           ANACOVA
      DO 20 I=1,NT                                                       ANACOVA
      IF(NOB(I).EQ.0) GO TO 99                                           ANACOVA
      NO=NOB(I)                                                          ANACOVA
      DO 10 J=1,NO                                                       ANACOVA
      L=L+1                                                              ANACOVA
      XM(I)=XM(I)+X(L)                                                   ANACOVA
      YM(I)=YM(I)+Y(L)                                                   ANACOVA
      SXX(I)=SXX(I)+X(L)*X(L)                                            ANACOVA
      SYY(I)=SYY(I)+Y(L)*Y(L)                                           ANACOVA
   10 SXY(I)=SXY(I)+X(L)*Y(L)                                           ANACOVA
      YM(NTT)=YM(NTT)+YM(I)                                             ANACOVA
      XM(NTT)=XM(NTT)+XM(I)                                             ANACOVA
      SXX(NTT)=SXX(NTT)+SXX(I)                                          ANACOVA
      SXY(NTT)=SXY(NTT)+SXY(I)                                          ANACOVA
      SYY(NTT)=SYY(NTT)+SYY(I)                                          ANACOVA
      SS(12)=SS(12)+SYY(I)                                              ANACOVA
      XM(I)=XM(I)/NO                                                    ANACOVA
      YM(I)=YM(I)/NO                                                    ANACOVA
      SXX(I)= SXX(I)-NO*XM(I)**2                                        ANACOVA
      SYY(I)=(SYY(I)-NO*YM(I)**2)/(NO-1.)                               ANACOVA
      SXY(I)= SXY(I)-NO*XM(I)*YM(I)                                     ANACOVA
      SL(I)=SXY(I)/SXX(I)                                               ANACOVA
      TREAT(I)= YM(I)-SL(I)*XM(I)                                       ANACOVA
      SS(1)=SS(1)+NO*YM(I)*YM(I)                                        ANACOVA
      SS(9)=SS(9)+SXX(I)*SL(I)**2                                       ANACOVA
      SXY(NT3)=SXY(NT3)+NO*XM(I)*YM(I)                                  ANACOVA
      SXX(NT3)=SXX(NT3)+NO*XM(I)**2                                     ANACOVA
      SXX(NT2)=SXX(NT2)+SXX(I)                                          ANACOVA
      SXY(NT2)=SXY(NT2)+SXY(I)                                          ANACOVA
      SXX(I)=SXX(I)/(NO-1.)                                             ANACOVA
      SXY(I)=SXY(I)/(NO-1.)                                             ANACOVA
   20 CONTINUE                                                          ANACOVA
      YM(NTT)=YM(NTT)/L                                                 ANACOVA
      XM(NTT)=XM(NTT)/L                                                 ANACOVA
      SXX(NTT)=(SXX(NTT)-L*XM(NTT)*XM(NTT))/(L-1.)                      ANACOVA
      SXY(NTT)=(SXY(NTT)-L*XM(NTT)*YM(NTT))/(L-1.)                      ANACOVA
      SSU=L*YM(NTT)*YM(NTT)                                             ANACOVA
      SYY(NTT)=(SYY(NTT)-SSU)/(L-1.)                                    ANACOVA
      SL(NTT)=SXY(NTT)/SXX(NTT)                                         ANACOVA
      SS(NTT)=SS(12)                                                    ANACOVA
      SL(NT2)=SXY(NT2)/SXX(NT2)                                         ANACOVA
      SS(6)=SXX(NT2)*SL(NT2)**2                                         ANACOVA
      SXX(NT2)=SXX(NT2)/(L-NT)                                          ANACOVA
      SXY(NT2)=SXY(NT2)/(L-NT)                                          ANACOVA
      SS(8)=SS(9)-SS(6)                                                 ANACOVA
      SXX(NT3)= (SXX(NT3) - L*XM(NTT)**2) /(NT-1.)                      ANACOVA
      SXY(NT3)= (SXY(NT3) - L*XM(NTT)*YM(NTT))/(NT-1.)                  ANACOVA
      IF(SXX(NT3).GT.0) GO TO 50                                        ANACOVA
      SL(NT3)=1.0E28                                                    ANACOVA
      TREAT(NT3)=YM(NTT)                                                ANACOVA
      SS(4)=0.                                                          ANACOVA
      SS(3)=0.                                                          ANACOVA
      GO TO 51                                                          ANACOVA
   50 CONTINUE                                                          ANACOVA
      SL(NT3)= SXY(NT3)/SXX(NT3)                                        ANACOVA
      SS(4)= (NT-1.)*SXX(NT3)*SL(NT3)**2                                ANACOVA
      SS(3)= (SL(NTT)-SL(NT3))**2/(1./(SXX(NT3)*(NT-1.))                ANACOVA
     2                           + 1./(SXX(NT2)*(L-NT)))                ANACOVA
      TREAT(NT3)=YM(NTT)-SL(NT3)*XM(NTT)                                ANACOVA
   51 CONTINUE                                                          ANACOVA
      SS(1)=SS(1)-SSU                                                   ANACOVA
      SS(5)= SS(1)-SS(4)                                                ANACOVA
      SS(2)= (L-1.)*SXX(NTT)*SL(NTT)**2                                 ANACOVA
      SS(10)=SSU+SS(1)+SS(9)                                            ANACOVA
      SS(7) =SSU+SS(1)+SS(6)                                            ANACOVA
      TREAT(NTT)=YM(NTT)-SL(NTT)*XM(NTT)                                ANACOVA
      SS(11)=SS(12)-SS(10)                                              ANACOVA
      TREAT(NT2)=0                                                      ANACOVA
      NDF(1)=NT-1                                                       ANACOVA
      NDF(2)= 1                                                         ANACOVA
      NDF(3)= 1                                                         ANACOVA
      NDF(4)= 1                                                         ANACC
      NDF(5)= NT-2                                                      ANACOVA
      NDF(6)= 1                                                         ANACOVA
      NDF(7)= NT+1                                                      ANACOVA
      NDF(8)= NT-1                                                      ANACOVA
      NDF(9)= NT                                                        ANACOVA
      NDF(10)=2*NT                                                      ANACOVA
      NDF(12)=L                                                         ANACOVA
      NDF(11)=L-NDF(10)                                                 ANACOVA
      DO 55 K=1,11                                                      ANACOVA
      IF(NDF(K).GT.0) GO TO 54                                          ANACOVA
      XMS(K)=0                                                          ANACOVA
      GO TO 55                                                          ANACOVA
   54 XMS(K)=SS(K)/NDF(K)                                               ANACOVA
   55 CONTINUE                                                          ANACOVA
      DO 60 K=1,10                                                      ANACOVA
      F(K)=XMS(K)/XMS(11)                                               ANACOVA
      IF(F(K).GT.0.) GO TO 59                                           ANACOVA
      PROBF(K)=0.                                                       ANACOVA
      GO TO 60                                                          ANACOVA
   59 PROBF(K)=FISH(F(K),NDF(K),NDF(7))                                 ANACOVA
   60 CONTINUE                                                          ANACOVA
      IF(IOPT.LT.1) GO TO 999                                           ANACOVA
      WRITE(6,150)                                                      ANACOVA
      WRITE(6,1)                                                        ANACOVA
    1 FORMAT(@0 TREAT@,T10,@NUM@,T18,@INDEPENDENT@,T34,@INDEPENDENT@,   ANACOVA
     2       T50,@DEPENDENT@,T67,@DEPENDENT@,T83,@COVARIANCE@,          ANACO
     3       T99,@INTERCEPT@,T118,@SLOPE@/2X,@MENT@,T10,@BER@,          ANACOVA
     4       T20,@MEAN@,T35,@VARIANCE@,T51,@MEAN@,T67,@VARIANCE@//)     ANACOVA
      DO 70 I=1,NT                                                      ANACOVA
      WRITE(6,2) I,NOB(I),XM(I),SXX(I),YM(I),SYY(I),SXY(I),TREAT(I),    ANACOVA
     2           SL(I)                                                  ANACOVA
   70 CONTINUE                                                          ANACOVA
    2 FORMAT(2X,I5,1X,I5,7(4X,G13.6))                                   ANACOVA
      WRITE(6,4) SXX(NT2),SXY(NT2),SL(NT2)                              ANACOVA
    4 FORMAT(1X,124(1H-)/2X,@1SLOPE@,26X,G13.6,38X,G13.6,21X,G13.6)     ANACOVA
      WRITE(6,5) SXX(NT3),SYY(NT3),SL(NT3)                              ANACOVA
    5 FORMAT(/2X,@SLOPE @,26X,G13.6,38X,G13.6,21X,G13.6/2X,@OF MEANS@)  ANACOVA
      WRITE(6,3)     L     ,XM(NTT),SXX(NTT),YM(NTT),SYY(NTT),SXY(NTT), ANACOVA
     Z               TREAT(NTT),SL(NTT)                                 ANACOVA
    3 FORMAT(/2X,@TOTAL@,1X,I5,7(4X,G13.6))                             ANACOVA
      WRITE(6,150)                                                      ANACOVA
      IF(IOPT.EQ.3) GO TO 80                                            ANACOVA
      WRITE(6,100) SSU,(NDF(I),SS(I),XMS(I),F(I),PROBF(I),I=1, 5)       ANACOVA
  100 FORMAT(//,15X,93(1H-),/,47X,@ANALYSIS OF COVARIANCE TABLE@,/,15X, ANACOVA
     193(1H-),/,15X,@SOURCE OF@,9X,@DEGREES OF@,5X,@SUM OF@,10X,@MEAN@, ANACOVA
     212X,@F-@,14X,@PROB@,/,15X,@VARIATION@,9X,@FREEDOM@,8X,@SQUARES@,  ANACOVA
     39X,@SQUARE@,10X,@RATIO@,11X,@F@,/,15X,93(1H-),/,15X,@MEAN@,19X,   ANACOVA
     *@1@,8X,G13.6,/,15X,@TREATMENTS@,4X,I10,8X,4(G13.6,3X),/,15X,      ANACOVA
     493(1H-),/,                                                        ANACOVA
     A            15X,@1 POPULATION @,1X,I10,8X,4(G13.6,3X)             ANACOVA
     B        ,/,15X,@1 POP.- SLOPE@,1X,I10,8X,4(G13.6,3X)              ANACO
     C        ,/,15X,@    OF MEANS @,/,15X ,                            ANACO
     * 93(1H-),/,15X,@SLOPE OF MEANS@,I10,8X,4(G13.6,3X)                ANACOVA
     D        ,/,15X,@DIFF MEAN SL.@,1X,I10,8X,4(G13.6,3X)              ANACOVA
     E        ,/,15X,@AND  PAR. SL.@                                    ANACOVA
     F        )                                                         ANACOVA
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      WRITE(6,102)      (NDF(I),SS(I),XMS(I),F(I),PROBF(1),I=6,10),      ANACOVA
     2              NDF(11),SS(11),XMS(11),NDF(12),SS(12)               ANACOVA
  102 FORMAT(                                                            ANACOVA
     F         ,/,15X,@PARALLEL LINE@,1X,I10,8X,4(G13.6,3X)              ANACOVA
     G         ,/,15X,@   SLOPE      @,/, 15X,                           ANACOVA
     H 93(1H-),/,15X,@PARALLEL LINE@,1X,I10,8X,4(G13.6,3X)               ANACOVA
     I         ,/,15X,@   MODEL      @,/,  15X,                          ANACOVA
     J 93(1H-),/,15X,@NON-           @,1X,I10,8X,4(G13.6,3X)             ANACOVA
     K         ,/,15X,@  PARALLELISM@,                                   ANACOVA
     L         ,/,15X,@INDIVIDUAL    @,1X,I10,8X,4(G13.6,3X)             ANACOVA
     M         ,/,15X,@  SLOPES      @,/, 15X,                           ANACOVA
     N 93(1H-),/,15X,@REGRESSION     @,1X,I10,8X,4(G13.6,3X)             ANACOVA
     O         ,/,15X,@  MODEL       @                                   ANACOVA
     P         ,/,15X,@ERROR         @,1X,I10,8X,2(G13.6,3X),/,          ANACOVA
     * 15X,                                                              ANACOVA
     Q 93(1H-),/,15X,@TOTAL          @,1X,I10,8X,  G13.6,/,              ANACOVA
     * 15X,                                                              ANACOVA
     R 93(1H-))                                                          ANACOVA
      WRITE(6,150)                                                       ANACOVA
      IF(IOPT.EQ.1) RETURN                                               ANACOVA
   80 NDF(7)=NDF(7)-1                                                    ANACOVA
      NDF(10)=NDF(10)-1                                                  ANACOVA
      NDF(12)=NDF(12)-1                                                  ANACOVA
      SS(7)=SS(7)-SSU                                                    ANACOVA
      SS(10)=SS(10)-SSU                                                  ANACOVA
      SS(12)=SS(12)-SSU                                                  ANACOVA
      XMS(7)=XMS(7)/NDF(7)                                               ANACOVA
      XMS(10)=XMS(10)/NDF(10)                                            ANACOVA
      F(7)=XMS(7)/XMS(11)                                                ANACOVA
      F(10)=XMS(10)/XMS(11)                                              ANACOVA
      PROBF(7)=FISH(F(7),NDF(7),NDF(11))                                 ANACOVA
      PROBF(10)=FISH(F(10),NDF(10),NDF(11))                              ANACOVA
      WRITE(6,101)      (NDF(I),SS(I),XMS(I),F(I),PROBF(I),I=1, 5)       ANACOVA
  101 FORMAT(//,15X,93(1H-),/,38X,@ANALYSIS OF COVARIANCE TABLE (MEAN DIANACOVA
     AFFERENCE)@,/,15X,                                                  ANACOVA
     193(1H-),/,15X,@SOURCE OF@,9X,@DEGREES OF@,5X,@SUM OF@,10X,@MEAN@,  ANACOVA
     212X,@F-@,14X,@PROB@,/,15X,@VARIATION@,9X,@FREEDOM@,8X,@SQUARES@,   ANACOVA
     39X,@SQUARE@,10X,@RATIO@,11X,@F@,/,15X,93(1H-),/,                   ANACOVA
     *                15X,@TREATMENTS@,4X,I10,8X,4(G13.6,3X),/,15X,      ANACOVA
     493(1H-),/,                                                         ANACOVA
     A             15X,@1 POPULATION @,1X,I10,8X,4(G13.6,3X)             ANACOVA
     B         ,/,15X,@1 POP.- SLOPE@,1X,I10,8X,4(G13.6,3X)              ANACOVA
     C         ,/,15X,@     OF MEANS @,/,   15X,                         ANACOVA
     * 93(1H-),/,15X,@SLOPE OF MEANS@,I10,8X,4(G13.6,3X)                 ANACOVA
     D         ,/,15X,@DIFF MEAN SL.@,1X,I10,8X,4(G13.6,3X)              ANACOVA
     E         ,/,15X,@AND  PAR. SL.@                                    ANACOVA
     F         )                                                         ANACOVA
      WRITE(6,102)      (NDF(I),SS(I),XMS(I),F(I),PROBF(1),I=6,10),      ANACOVA
     2              NDF(11),SS(11),XMS(11),NDF(12),SS(12)               ANACOVA
      WRITE(6,150)                                                       ANACOVA
  150 FORMAT(1H1)                                                        ANACOVA
  999 RETURN                                                             ANACOVA
   99 IOPT=-1                                                            ANACOVA
      RETURN                                                             ANACOVA
      END                                                                ANACOVA
      SUBROUTINE FOURG (DATA,N,ISIGN,WORK)                               FOURG
C     COOLEY-TUKEY FAST FOURIER TRANSFORM IN USASI BASIC FORTRAN.        FOURG
C     ONE-DIMENSIONAL TRANSFORM OF COMPLEX DATA, ARBITRARY NUMBER OF     FOURG
C     POINTS.  N POINTS CAN BE TRANSFORMED IN TIME PROPORTIONAL TO       FOURG
C     N*LOG(N) (FOR N NON-PRIME), WHEREAS OTHER METHODS TAKE N**2 TIME.  FOURG
```

```
C     FURTHERMORE, BECAUSE FEWER ARITHMETIC OPERATIONS ARE PERFORMED,   FOURG
C     LESS ERROR IS BUILT UP.  THE TRANSFORM DONE IS--                  FOURG
C     DIMENSION DATA(N),TRANSFORM(N),WORK(N)                            FOURG
C     COMPLEX DATA,TRANSFORM,WORK                                       FOURG
C     TRANSFORM(K) = SUM(DATA(J)*EXP(ISIGN*2*PI*I*(J-1)*(K-1)/N)),      FOURG
C     SUMMED FROM J = 1 TO N FOR ALL K FROM 1 TO N.  THE TRANSFORM      FOURG
C     VALUES ARE RETURNED TO DATA, REPLACING THE INPUT.  N MAY BE ANY   FOURG
C     POSITIVE NUMBER, BUT IT SHOULD BE NON-PRIME FOR SPEED.  ISIGN =   FOURG
C     +1 OR -1.  A -1 TRANSFORM FOLLOWED BY A +1 ONE (OR VICE VERSA)    FOURG
C     RETURNS N TIMES THE ORIGINAL DATA.  WORK IS A ONE-DIMENSIONAL     FOURG
C     COMPLEX ARRAY OF LENGTH N USED FOR WORKING STORAGE.               FOURG
C     RUNNING TIME IS PROPORTIONAL TO N * (SUM OF THE PRIME FACTORS OF  FOURG
C     N).  FOR EXAMPLE, N = 1960, TIME IS T0 * 1960 * (2+2+2+5+7+7).    FOURG
C     NAIVE METHODS DIRECTLY IMPLEMENTING THE SUMMATION RUN IN TIME     FOURG
C     PROPORTIONAL TO N**2.  AN UPPER BOUND FOR THE RMS RELATIVE ERROR  FOURG
C     IS 3 * 2**(-B) * SUM(F**1.5), WHERE B IS THE NUMBER OF BITS IN    FOURG
C     THE FLOATING POINT FRACTION AND THE SUM IS OVER THE PRIME         FOURG
C     FACTORS OF N.  WRITTEN BY NORMAN BRENNER, MIT LINCOLN LABORATORY, FOURG
C     AUGUST 1968.  SEE--IEEE TRANSACTIONS ON AUDIO AND ELECTROACOUSTICSFOURG
C     (JUNE 1967), SPECIAL ISSUE ON THE FAST FOURIER TRANSFORM.         FOURG
      DIMENSION DATA(1), WORK(1), IFACT(32)                             FOURG
      TWOPI=6.283185307*FLOAT(ISIGN)                                    FOURG
C     FACTOR N INTO ITS PRIME FACTORS, NFACT IN NUMBER.  FOR EXAMPLE,   FOURG
C     FOR N = 1960, NFACT = 6 AND IFACT(IF) = 2, 2, 2, 5, 7 AND 7.      FOURG
      IF=0                                                              FOURG
      NPART=N                                                           FOURG
      DO 50 ID=1,N,2                                                    FOURG
      IDIV=ID                                                           FOURG
      IF (ID-1) 10,10,20                                                FOURG
 10   IDIV=2                                                            FOURG
 20   IQUOT=NPART/IDIV                                                  FOURG
      IF (NPART-IDIV*IQUOT) 40,30,40                                    FOURG
 30   IF=IF+1                                                           FOURG
      IFACT(IF)=IDIV                                                    FOURG
      NPART=IQUOT                                                       FOURG
      GO TO 20                                                          FOURG
 40   IF (IQUOT-IDIV) 60,60,50                                          FOURG
 50   CONTINUE                                                          FOURG
 60   IF (NPART-1) 80,80,70                                             FOURG
 70   IF=IF+1                                                           FOURG
      IFACT(IF)=NPART                                                   FOURG
 80   NFACT=IF                                                          FOURG
C     SHUFFLE THE DATA ARRAY BY REVERSING THE DIGITS OF THE INDEX.      FOURG
C     REPLACE DATA(I) BY DATA(IREV) FOR ALL I FROM 1 TO N.  IREV-1 IS   FOURG
C     THE INTEGER WHOSE DIGIT REPRESENTATION IN THE MULTI-RADIX         FOURG
C     NOTATION OF FACTORS IFACT(IF) IS THE REVERSE OF THE REPRESENTATIONFOURG
C     OF I-1.  FOR EXAMPLE, IF ALL IFACT(IF) = 2, THEN FOR I-1 = 11001, FOURG
C     IREV-1 = 10011.  A WORK ARRAY OF LENGTH N IS NEEDED.              FOURG
      IP0=2                                                             FOURG
      IP3=IP0*N                                                         FOURG
      IWORK=1                                                           FOURG
      I3REV=1                                                           FOURG
      DO 110 I3=1,IP3,IP0                                               FOURG
      WORK(IWORK)=DATA(I3REV)                                           FOURG
      WORK(IWORK+1)=DATA(I3REV+1)                                       FOURG
      IP2=IP3                                                           FOURG
      DO 100 IF=1,NFACT                                                 FOURG
      IP1=IP2/IFACT(IF)                                                 FOURG
      I3REV=I3REV+IP1                                                   FOURG
      IF (I3REV-IP2) 110,110,90                                         FOURG
```

```
   90 I3REV=I3REV-IP2                                                   FOURG
  100 IP2=IP1                                                           FOURG
  110 IWORK=IWORK+IP0                                                   FOURG
      IWORK=1                                                           FOURG
      DO 120 I3=1,IP3,IP0                                               FOURG
      DATA(I3)=WORK(IWORK)                                              FOURG
      DATA(I3+1)=WORK(IWORK+1)                                          FOURG
  120 IWORK=IWORK+IP0                                                   FOURG
C     PHASE-SHIFTED FOURIER TRANSFORM OF LENGTH IFACT(IF).              FOURG
C     IPROD=IP1/IP0                                                     FOURG
C     IREM=N/(IFACT(IF)*IPROD)                                          FOURG
C     DIMENSION DATA(IPROD,IFACT(IF),IREM),WORK(IFACT(IF))              FOURG
C     COMPLEX DATA,WORK                                                 FOURG
C     DATA(I1,J2,I3) = SUM(DATA(I1,I2,I3) * W**(I2-1)), SUMMED OVER     FOURG
C     I2 = 1 TO IFACT(IF) FOR ALL I1 FROM 1 TO IPROD, J2 FROM 1 TO      FOURG
C     IFACT(IF) AND I3 FROM 1 TO IREM.                                  FOURG
C     W = EXP(ISIGN*2*PI*I*(I1-1+IPROD*(J2-1))/(IPROD*IFACT(IF))).      FOURG
      IF=0                                                              FOURG
      IP1=IP0                                                           FOURG
  130 IF (IP1-IP3) 140,240,240                                          FOURG
  140 IF=IF+1                                                           FOURG
      IFCUR=IFACT(IF)                                                   FOURG
      IP2=IP1*IFCUR                                                     FOURG
      THETA=TWOPI/FLOAT(IFCUR)                                          FOURG
      SINTH=SIN(THETA/2.)                                               FOURG
      ROOTR=-2.*SINTH*SINTH                                             FOURG
C     COS(THETA)-1, FOR ACCURACY                                        FOURG
      ROOTI=SIN(THETA)                                                  FOURG
      THETA=TWOPI/FLOAT(IP2/IP0)                                        FOURG
      SINTH=SIN(THETA/2.)                                               FOURG
      WSTPR=-2.*SINTH*SINTH                                             FOURG
      WSTPI=SIN(THETA)                                                  FOURG
      WMINR=1.                                                          FOURG
      WMINI=0.                                                          FOURG
      DO 230 I1=1,IP1,IP0                                               FOURG
      IF (IFCUR-2) 150,150,170                                          FOURG
  150 DO 160 I3=I1,IP3,IP2                                              FOURG
      J0=I3                                                             FOURG
      J1=I3+IP1                                                         FOURG
      TEMPR=WMINR*DATA(J1)-WMINI*DATA(J1+1)                             FOURG
      TEMPI=WMINR*DATA(J1+1)+WMINI*DATA(J1)                             FOURG
      DATA(J1)=DATA(J0)-TEMPR                                           FOURG
      DATA(J1+1)=DATA(J0+1)-TEMPI                                       FOURG
      DATA(J0)=DATA(J0)+TEMPR                                           FOURG
  160 DATA(J0+1)=DATA(J0+1)+TEMPI                                       FOURG
      GO TO 220                                                         FOURG
  170 IWMAX=IP0*IFCUR                                                   FOURG
      DO 210 I3=I1,IP3,IP2                                              FOURG
      I2MAX=I3+IP2-IP1                                                  FOURG
      WR=WMINR                                                          FOURG
      WI=WMINI                                                          FOURG
      DO 200 IWORK=1,IWMAX,IP0                                          FOURG
      I2=I2MAX                                                          FOURG
      SUMR=DATA(I2)                                                     FOURG
      SUMI=DATA(I2+1)                                                   FOURG
  180 I2=I2-IP1                                                         FOURG
      TEMPR=SUMR                                                        FOURG
      SUMR=WR*SUMR-WI*SUMI+DATA(I2)                                     FOURG
      SUMI=WR*SUMI+WI*TEMPR+DATA(I2+1)                                  FOURG
      IF (I2-I3) 190,190,180                                            FOURG
```

```
 190  WORK(IWORK)=SUMR                                                  FOURG
      WORK(IWORK+1)=SUMI                                                FOURG
      TEMPR=WR                                                          FOUR
      WR=WR*ROOTR-WI*ROOTI+WR                                           FOUR
 200  WI=TEMPR*ROOTI+WI*ROOTR+WI                                        FOURG
      IWORK=1                                                           FOURG
      DO 210 I2=I3,I2MAX,IP1                                            FOURG
      DATA(I2)=WORK(IWORK)                                              FOURG
      DATA(I2+1)=WORK(IWORK+1)                                          FOURG
 210  IWORK=IWORK+IP0                                                   FOURG
 220  TEMPR=WMINR                                                       FOURG
      WMINR=WMINR*WSTPR-WMINI*WSTPI+WMINR                               FOURG
 230  WMINI=TEMPR*WSTPI+WMINI*WSTPR+WMINI                               FOURG
      IP1=IP2                                                           FOURG
      GO TO 130                                                         FOURG
 240  RETURN                                                            FOURG
      END                                                               FOURG
      SUBROUTINE LAGCOR(LA,A,LB,B,C,LSTART,LSTOP)                       LAGCOR
C                                                                       LAGCOR
C     THIS ROUTINE CALCULATES A SAMPLE CROSS-CORRELATION OF THE RECORD  LAGCOR
C            A OVER THE RECORD B WITH LAGS BETWEEN LSTART AND LSTOP AND LAGCOR
C            STORES THE RESULT IN C                                     LAGCOR
C    **** CAUTION ***** THERE IS NO CHECK FOR A ZERO RECORD             LAGCOR
C                                                                       LAGCOR
      DIMENSION A(LA),B(LB),C(LA)                                       LAGCOR
      DO 50 J=LSTART,LSTOP                                              LAGCOR
      U=0.0                                                             LAGCOR
      SUMA=0.0                                                          LAGCOR
      SUMB=0.0                                                          LAGCOR
      SA=0.0                                                            LAG
      SB=0.0                                                            LAGCOR
      IF(LB-(LA-J+1)) 10,10,20                                          LAGCOR
   10 N=LB                                                              LAGCOR
      GO TO 30                                                          LAGCOR
   20 N=LA-J+1                                                          LAGCOR
      IF(N.GT.0) GO TO 30                                               LAGCOR
      DO 25 I=J,LSTOP                                                   LAGCOR
   25 C(I)=-2.                                                          LAGCOR
      RETURN                                                            LAGCOR
   30 EN=N                                                              LAGCOR
      DO 40 I=1,N                                                       LAGCOR
      IJ=I+J-1                                                          LAGCOR
      SUMA=SUMA+A(IJ)                                                   LAGCOR
      SUMB=SUMB+B(I)                                                    LAGCOR
      SA=SA+A(IJ)*A(IJ)                                                 LAGCOR
      SB=SB+B(I)*B(I)                                                   LAGCOR
   40 U=U+A(IJ)*B(I)                                                    LAGCOR
      SUMA=SUMA/EN                                                      LAGCOR
      SUMB=SUMB/EN                                                      LAGCOR
      SA=SA-SUMA*SUMA*EN                                                LAGCOR
      SB=SB-SUMB*SUMB*EN                                                LAGCOR
   50 C(J)=(U-EN*SUMA*SUMB)/SQRT(SA*SB)                                 LAGCOR
      RETURN                                                            LAGCOR
      END                                                               LAGCOR
```

APPENDIX E - Format of Retrieval Cards

APPENDIX E - FORMAT OF CARDS REQUIRED FOR RETRIEVAL

E.1 General Structure

All input retrieval cards have the following format:

FORMAT(A4,1X,A4,1X,14I5)

Columns 1 - 4	Contain the key word for a control card.
Column 5	Is ignored and may contain the last character of a key word.
Columns 6 - 10	Contain a qualifier word. For a JOB card this word must be DATE, VOLU or BOTH. For other cards this word must be EACH, ALL, RANGE or blanks. A blank field is equivalent to ALL.

The following is a list of the valid key words:

JOB	- Contains JOB ID, date save option, total volume save option, and plot control.
STUDY	- Specifies which studies are to be retrieved.
DATE	- Specifies which dates are to be retrieved.
MAN	- Provision to specify man to be retrieved, currently not implemented as program always uses man 1, 2 and 3.
TYPE	- Specifies which sample types are to be retrieved.
TEST	- Specifies which tests are to be retrieved.
END	- End of run.
EOF	- End of job.

E.2 Specific Retrieval Cards

JOB CARD

Column 1 - JOB

The second field of the JOB card (columns 6-10) must contain one of the following parameters. The parameter must always begin in column 6.

DATE - Indicates that the Julian date of the samples being retrieved is to be saved for output. Always required for plot and most analysis.

VOLUM - Indicates that the total 24-hour urine volume for the dates being retrieved is to be saved for output.

BOTH - Indicates that both dates and total volumes are to be saved for output.

(BLANK) - A blank field or mispelled words will cause an error message and the default DATE to be used.

The third field of the JOB card (columns 11 - 15) provides a place for the user's job identification number. It may be any 5 digit integer. However, if the integer is less than 1000, no plots will be produced.

The remaining thirteen 5 column fields of the JOB card are for use by the statistical portion of this program. Currently these are not used, but in the future they can be used for control of statistical subroutines. They must always be 5 digit integers.

STUDY CARD

COLUMN 1 STUDY

COLUMNS 6 - 10 RANGE, EACH, ALL or BLANK

Blank or ALL - retrieves data from all missions
EACH - retrieves data from study numbers specified in Col. 15, 20, 25, 30, 35, 40, 45...60.
RANGE - Study range from Col. 15 to Col. 20.

Study codes are found in Table E.3.

DATE CARD

COLUMN 1	DATE
COLUMNS 6 - 10	EACH, ALL, Blank Range

ALL = Blank	Get all dates
EACH	Use individual dates in Col. 15 → up.
RANGE	Date range from Col. 15 to Col. 20

Dates are Julian Dates. Date ranges for specific missions are found in Table E.3.

MAN CARD

COLUMN 1	MAN
COLUMNS 6 - 10	Same as DATE card except Man numbers are specified. (See Table E.3.)

TYPE CARD

COLUMN 1	TYPE
COLUMNS 6 - 10	Type codes are same as DATE card, found in Table E.3.

TEST CARD

COLUMN 1	TEST
COLUMN 6	RANGE
COLUMNS 11 - 15	Starting test of range
COLUMNS 16 - 20	Ending test of range

If only one test, the test must appear in both fields. See Table B.1 for valid test numbers.

END CARD

When an END card is encountered, the program starts the retrieval. Therefore,all search criteria indicated on the JOB, STUDY, DATE, TYPE & TEST cards must be read in before the END card. There must be an END card for each run.

The first run must contain at least one JOB card, STUDY card, DATE card, TYPE card, and TEST card. These initial parameters remain as the search criteria for each succeeding run, unless changed by another JOB, STUDY, DATE, TYPE or TEST card. There may be no more than one JOB card per run, but each run may have as many STUDY, DATE, TYPE & TEST cards as required.

EOF CARD

When an EOF card is encountered, the program stops and the total job is considered finished. There may be as many runs within a job as needed by the user. Several jobs may be stacked. Parameters set in one job remain constant unless changed.

E.3 Codes For Data Forms

TABLE E.3

NUMBER CODES FOR DATA FORMS

STUDY	TYPE
1 = SMEAT	1 = FRESH URINE
2 = SKYLAB 2	2 = FROZEN URINE
3 = SKYLAB 3	3 = LYOPHILIZED URINE
4 = SKYLAB 4	4 = URINE SKYLAB BAG SAMPLES (PREFLIGHT & INFLIGHT)
5 = APOLLO 17	5 = PLASMA
6 =	6 = SPECIAL PLASMA - PREFLIGHT LYTHEIUM EDTA
7 =	7 = SERUM
8 =	8 = 10% URINE SAMPLE
9 =	9 = FROZEN PLASMA
	10 =
	11 =
	12 =
	13 =
	14 =
	15 =

DATA FORMS
-1 = TEST NOT PERFORMED
-2 = LESS THAN DETERMINABLE
-3 = TO FOLLOW
-4 = CALCULATED AS COMBINED VALUES
-5 = LESS THAN A 24 HR. PERIOD

JULIAN DATES

	START	LAUNCH	SPLASH DOWN	END
SMEAT	180	208	265	
SKYLAB 2	114	144	172	
SKYLAB 3	189	209	268	285
SKYLAB 4	283	320	404*	
APOLLO 17	290	342	354	

*Date is 39 of following year

MAN	SMEAT	APOLLO 17	SKYLAB 2	SKYLAB 3	SKYLAB 4
1 = CDR	Crippen	Cernan	Conrad		
2 = PLT	Bobko	Evans	Weitz		
3 = SPT	Thornton	Schmitt	Kerwin		
4 = C1	Alexander	Duke	Schweikart		
5 = C2	Strzynek	Roosa	Musgrave		
6 = C3	Laird	Young	Mc Candless		
7 = C4	Kimzey	Alexander	Alexander		
8 =		Buchanan	Hordinsky		
9 =		La Pinta	La Pinta		

E.4 Sample Input Card Decks

```
JOB DATE     400
STUDY EACH     3
DATE ALL
TYPE EACH      1
TEST RANGE   519 523
END
EOF
```

```
JOB DATE    4300
STUDY EACH     3
DATE ALL
TYPE EACH      5
TEST RANGE   312 314
END
JOB DATE    4301
TEST RANGE   317 320
END
EOF
```

APPENDIX F - MISCELLANEOUS INFORMATION

F.1 - SAMPLE NUMBERS

Sample numbers as they exist in the sample directory for the various missions:

SMEAT	2-674
APOLLO 17	675-936

Sample number for the Skylab missions are not separated.

SKYLAB 2	937-1490
SKYLAB 3	937-2256
SKYLAB 4	937-2256

F.2 ADDITION OF NEW DATA ITEMS

Program Build

1. Increase Dimensions On:

   INDX
   INDX1
   INDX2
   INDX3
   INDX4
   INDX5

   The order of additions is determined by the form number and form position of the new item.

2. In data array of INDX add in test number of new data.

3. Data array of INDX1 add in a U or B for new data in position corresponding to position in INDX.

4. Add appropriate name into INDX2 array.

5. Add index of item in mass storage record into INDX3.

6. Add form number into INDX4.

7. Add field number on card form.

8. Decode statement and format for card number involved changed increase IEND and DO parameter.

9. Add 1 to all following K values. These are start positions in mass storage record. Note DIET parameters work down from top.

10. Increase end parameter for DO 81 in UPDATE card processor.

11. Mass storage records must be checked to insure space.

Program Retrieve

1. In subroutine RETRIEVE

   LREC is maximum 125 for URINE and 25 for BLOOD - if additions run over these numbers dimensions must be changed on LTEST, IBL and/or IUR.

2. In subroutine TEXT

Insert TEXT name of new item into MBLD or MURN array indexed by test #. May require additional space.

Insert units as above into MITS, MITB.

K	IEND		
2	7	2	8
8	12	9	12
19	16	20	
34	10	35	
43	5	44	
47	16	48	
62	15	63	
76	16	77	
91	15	92	
116	11	117	

Search INDX4 for card number

Check INDX5 for match to J else continue search

Pickup INDX3 as index for store

F.3 AUXILLIARY FILES

1. All data is for mission 3 (SKYLAB 3)
2. Each file is for one man
3. Data is from URINE file including DIET Data
4. File names FMAN1, FMAN2, FMAN3 for CDR, PLT, and SPT, resp.
5. FORTRAN Unformatted 130 words/record

Word		
1 and 126	Sample number	Integer
2-105	Urine Sample Data	Real (See index Table B.1)
106-115	Not Used	
116-125	DIET Data	Real
126	Sample number	Integer
127	STUDY	All study 3
128	JULIAN DATE	
129	MAN	All 1 in file FMAN1, 2 in FMAN2, etc.
130	Sample Type	All URINE and DIET is type 1

F.4 AVAILABLE FILES AND CARD DECKS

BUILD

This program exists as a MODIFY program library (BUILD PL) and also as a card deck. A run deck to cause BUILD to create new files is labelled CREATE and is listed in Section 3. A run deck to cause BUILD to update existing files is labelled UPDATE and is also listed in Section 4. (See Appendix D for listings.)

TYPLOK

This program exists only as a card deck and is a programmers tool to insure integrity of the file structure. (See Appendix D for listings.)

RETRIEVAL

This is the primary retrieval and analysis program, it exists as a MODIFY program library. A deck of control cards exists to cause execution of the program. Also sample data cards are available. (See Appendix D for listings.)

F.5 SAMPLE DIRECTORY RECORD LAYOUT: FILE RA1 CONTENTS (00 CARDS)

Record Length 35 words

Words 1-12 and 14 are binary integer. Word 13 is binary real.

Refer to Appendix E for variable values

Word	Variable
1	Sample Number
2	Study Number (Mission Code)
3	Julian Date of Sample
4	Man Number
5	Sample Type
6	GMT
7	Month of Sample
8	Day of Sample
9	Year of Sample
10	TOTAL Volume ml
11	BAG Volume ml
12	BAG Number
13	VDR
14	Master Sample Number
15-25	Alpha Remarks
26-35	Unused