AMRL-TR-78-38

EDITING PROCEDURE FOR ANTHROPOMETRIC SURVEY DATA

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AMRL-TR-78-38

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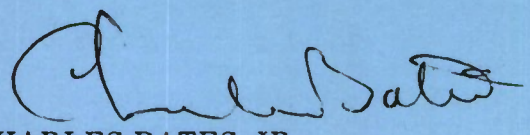
FOR THE COMMANDER



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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Described in this report are two computer programs designed to edit large masses of anthropometric survey data. The XVAL (eXtreme VALues) program scans for gross errors by sorting out the ten highest and ten lowest values in a given set of data for visual inspection. The EDIT (EDITing) program, a technique for sifting data more finely, tests each data point for each subject by comparing the measured value with a predicted value obtained from regression equations and flagging those which deviate from set limits.

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20. ABSTRACT (continued)

Detailed descriptions of input routines and computer output are liberally illustrated at every step. Instructions for the use of these programs are given to enable programmers to apply them to their own data. Computer printouts of the entire XVAL and EDIT programs, applied to actual data, are included as appendices.

The authors emphasize the limitations of these programs by pointing out that however sophisticated the editing routines, they can only serve to discover, identify and flag possible errors. It is left to the experienced professional to confirm the deviant value as an error, assess its nature and decide whether to eliminate, correct or replace it.

AD-A060393

PREFACE

The computer routines described in this report were developed and revised over the years by Edmund Churchill of the Anthropology Research Project (ARP), under contract to the Aerospace Medical Research Laboratory (AMRL), Wright-Patterson Air Force Base. The authors wish to extend their thanks to C. E. Clauser, Sandra Stevenson and M. J. Warrick of AMRL, and Sue Evans, University of Dayton Research Institute for critical reading of the draft manuscript and their suggestions for its improvement. The report was edited by Ilse Tebbetts and prepared for publication by Jane Reese, both of ARP, under USAF contracts F33615-77-C-0503 and F33615-77-C-0505.

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INTRODUCTION

It is inevitable, however unfortunate, that any large collection of anthropometric data will contain an unknown number of errors. While the sources of such mistakes are many, their chief cause is human fallibility. In the 1967 U. S. Air Force Anthropometric Survey, for example, 2420 flight crewmen were measured for 190 variables--an awesome total of 459,800 measurements. It requires but a momentary mental distraction during any of the measuring or data processing steps to cause an error to slip into the recorded material. Mistakes can occur during the marking or positioning of subjects, during the measuring of subjects or the reading of instruments, as well as during the recording, transposition and punching of data.

It is of some importance, therefore, to introduce methods for the checking and evaluation of anthropometric data which can provide some degree of assurance that errors of measurement and recording are identified and reduced to a minimum. This is accomplished at increasingly more sophisticated levels with the aid of a high-speed computer which can rapidly check and evaluate vast numbers of numerical observations in a systematic fashion.

The two editing programs described here were developed by Edmund Churchill of the Anthropology Research Project under contract to the Aerospace Medical Research Laboratory and, when used together, effect a "coarse" and "fine" sifting of the data. The XVAL (eXtreme VALues) routine scans for gross errors by sorting out the ten highest and ten lowest values from a given group for examination. The EDIT (EDITing) program is used to test each data point for each subject by comparing the measured value with a predicted value obtained from regression equations and flagging those which exceed set limits. While either one of the two programs can be used without the other, they have been developed as complementary procedures and are, by far, more effective together than they are separately.

In general, the editing of anthropometric data consists of three sequential steps:

- selection of a suitable test function,
- selection of an appropriate acceptance/rejection level,
- selection of a course of action when rejection of a data point occurs.

Both editing programs described here routinely achieve the first objective, leaving to the user (in the case of the EDIT program) only the task of selecting the variables to be used in the regression equations.

Selection of an appropriate acceptance/rejection level (second step) is, of course, left to the user and can be as stringent or as lax as desired. The user must decide on the trade-offs between establishing a low rejection level resulting in the increased possibility of retaining erroneous values, and setting very stringent limits thereby increasing the possibility of rejecting valid data because they deviate in an insignificant way from the rest of the distribution of values.

The third step is also left to the user's discretion. When a data point is obviously in error, the decision to correct, delete, substitute or remeasure is one which must be made by the user based on his knowledge and judgment concerning the worth of the data point. If the faulty value is one of a large series and does not affect the sample distribution, deletion or substitution may be in order. If the data point is important to the distribution, then remeasurement may be called for if an appropriate substitution cannot be found.

While the techniques discussed here and more fully described on the ensuing pages are designed and most often used for editing anthropometric survey data when both the sample size and the number of variables are relatively large (n >100), they can be applied equally well to studies involving fewer subjects and variables.

THE EXTREME VALUES (XVAL) PROGRAM*

The basic purposes of the eXtreme VALues (XVAL) program are to provide an initial scanning of a set of data, singling out extreme outlyers worthy of examination for errors in recording, punching, or coding, and to provide first approximations for the means and standard deviations for each variable in the total sample. This program is the first one used in editing our anthropometric data. We check the outlyers, correcting or discarding those in obvious error. Usually the data are then rerun and the process repeated until the values at the tails of the distributions are deemed acceptable. For many sets of data this final output may provide all the editing needed.

The XVAL program evolved from a series of rather simple programs designed to provide a listing of the very smallest and the very largest values for each of several sets of data. As the program has evolved, the present output also provides many of the standard summary statistics, two optional listings and an optional set of punched cards, as well as a number of other pieces of information all of which we shall describe.

THE OUTPUT

The primary XVAL output is shown in Figure 1. The values in each column refer to the variable whose name and number are listed at the top of the column. Thus, the first column contains:

(1) The ten smallest values of age.

(2) Subject or record number. (As can be seen, subject #120 had a recorded age of 13.5 years, clearly a suspect value in a military survey.)

(3) The ten largest values of age.

(4) The arithmetic mean of the entire sample.

(5) The standard deviation of the entire sample.

(6) The coefficient of variation for the entire sample.

(7) A value expressing the variation within the 10 top values as a fraction of the difference between the 10th smallest and the 10th largest values.

---

* A complete printout of the XVAL program is included as Appendix A.

STATISTICS FOR VARIABLES 1 THROUGH 8

	1 AGE		2 WEIGHT		3 GRIP STRENGTH		4 STATURE		5 CERVICALE HEIGHT		6 ACROMION HEIGHT		7 STATURE-CERVICALE		8 HEIGHT/WEIGHT**1/3	
	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT
1ST SMALLEST	135.0	120	132.0	145	41.0	154	1389.0	82	1347.0	145	1278.0	145	-215.0	82	198.0	16
2ND SMALLEST	305.0	95	140.0	128	42.0	177	1602.0	145	1392.0	173	1329.0	60	221.0	77	251.2	82
3RD SMALLEST	315.0	112	142.0	59	42.0	135	1643.0	173	1400.0	60	1329.0	35	223.0	84	289.3	106
4TH SMALLEST	315.0	82	145.0	139	42.0	92	1644.0	35	1401.0	35	1335.0	95	230.0	64	291.3	122
5TH SMALLEST	325.0	100	147.0	95	43.0	126	1646.0	93	1405.0	95	1337.0	173	231.0	169	292.4	69
6TH SMALLEST	325.0	89	148.0	177	44.0	165	1650.0	60	1407.0	93	1349.0	36	232.0	86	293.3	60
7TH SMALLEST	325.0	87	148.0	151	44.0	80	1651.0	95	1414.0	36	1351.0	93	233.0	164	293.5	98
8TH SMALLEST	325.0	86	149.0	72	44.0	67	1657.0	36	1417.0	165	1356.0	103	233.0	117	294.4	79
9TH SMALLEST	335.0	111	149.0	29	45.0	94	1672.0	103	1417.0	80	1356.0	80	233.0	107	295.9	40
XTH SMALLEST	335.0	88	150.0	93	45.0	93	1676.0	80	1420.0	103	1363.0	119	233.0	15	296.3	150
******																
XTH LARGEST	445.0	18	213.0	69	66.0	43	1875.0	108	1613.0	133	1544.0	43	283.0	42	330.4	139
9TH LARGEST	445.0	24	216.0	44	67.0	38	1881.0	120	1621.0	120	1545.0	172	284.0	91	330.5	130
8TH LARGEST	445.0	33	216.0	112	67.0	104	1882.0	44	1622.0	108	1547.0	109	285.0	75	331.5	70
7TH LARGEST	445.0	35	221.0	144	68.0	109	1886.0	83	1623.0	157	1551.0	89	285.0	149	331.7	19
6TH LARGEST	445.0	38	225.0	122	68.0	112	1892.0	157	1624.0	83	1553.0	108	286.0	165	331.8	111
5TH LARGEST	445.0	44	231.0	155	68.0	122	1899.0	43	1630.0	140	1566.0	140	287.0	20	332.6	157
4TH LARGEST	445.0	59	237.0	83	70.0	57	1906.0	140	1631.0	44	1579.0	44	292.0	33	335.0	72
3RD LARGEST	445.0	67	239.0	31	70.0	81	1913.0	102	1669.0	20	1585.0	102	294.0	43	335.7	38
2ND LARGEST	445.0	123	242.0	98	71.0	98	1923.0	31	1675.0	31	1607.0	20	296.0	176	338.8	102
1ST LARGEST	445.0	126	710.0	16	73.0	106	1956.0	20	1675.0	102	1607.0	31	299.0	142	351.9	128
THE MEAN VALUE	399.57		183.88		55.17		1769.28		1516.54		1451.22		252.74		312.91	
STD. DEVIATION	44.93		48.15		6.70		72.21		60.80		59.34		41.41		15.17	
COFF/VARIATION	11.25		26.18		12.15		4.08		4.01		4.09		16.38		4.85	
''TOP''	1.82		.29		.19		1.44		.37		.47		8.96		2.88	
''BOT''	0.00		7.89		.33		.41		.28		.35		.32		.63	
VETA ONE	-1.85		8.87		.22		-.74		.25		.14		-9.69		-3.22	
VETA TWO	9.86		97.11		2.67		7.08		3.01		3.03		110.07		25.15	
(N-20)-AVG EST	403.81		179.77		55.04		1770.39		1515.93		1450.88		255.16		313.80	
(N-20)-S.D.EST	45.95		20.43		6.83		66.83		60.52		59.15		15.03		10.95	
PCT DIFF/MEANS	-9.		20.		2.		-2.		1.		1.		-16.		-8.	
PCT DIF/ST DVS	-2.		136.		-2.		8.		0.		0.		175.		38.	
SIZE OF SAMPLE	138		147		146		148		148		148		148		147	

1/20/78 ** --- XVAL TEST --- ** PAGE 2

Figure 1. The primary output of the XVAL program (age in tenths of years, weight and grip strength in tenths of kilograms, values for all other variables in millimeters).

(8) A value expressing the variation within the 10 bottom values as a fraction of the difference between the 10th smallest and the 10th largest values.

(9) Symmetry or skewedness (veta I).

(10) Kurtosis or peakedness (veta II).

(11) Estimate of the mean after elimination of the 10 top and 10 bottom values.

(12) Estimate of the standard deviation after elimination of the 10 top and 10 bottom values.

(13) The difference between the mean (4) and the estimated mean (11) expressed as a percent of the estimated standard deviation.

(14) The difference between the standard deviation (5) and the estimated standard deviation (12) expressed as a percent of the estimated standard deviation.

(15) The number of data points for this variable.

Note that if the sample size for any variable is less than 30, the n-20 mean and standard deviation estimates and the statistics TOP and BOT are not computed for that variable. If the sample size is less than or equal to 20, only the total sample mean and standard deviation are computed along with some range card values.

The label (16) at the bottom of the page in the center, and the date (17) at left have been read in from cards. The page number (18) at right is kept track of by the program.

A summary table (Figure 2) follows this output. It contains for each variable, (1) the mean value, (2) the standard deviation, (3) and (4) the measures of skewness and kurtosis, (5) the coefficient of variation, (6) and (7) the percentage difference for the mean and standard deviation as described in 13 and 14 above, (8) the sample size for that variable, and (9) the minimum value for that variable. The final seven values contained in the summary statistics for each variable make up the optional card output (Figure 3) for XVAL along with the variable number and name as follows:

The Summary Statistics	The Optional Punched Name-Range Cards	
	Columns 1-4:	the variable number
	Columns 7-24:	the variable name

A SUMMARY OF THE MATERIAL ALREADY PRESENTED EITHER ON THE PRECEDING PAGES OR ON THE PUNCHED RANGE CARDS

		①	②	③	④	⑤	⑥	⑦	⑧	⑨	---THE RANGE CARD VALUES---						
NO.	VARIABLE NAME	MEAN	STD DEV	V-I	V-II	V	DELM	DELS	N	MINIMUM	MIN	MAX	AVG	INTV1	INTV2	CF1	CF2
1	AGE	399.57	44.93	-1.85	9.86	11.2%	-9.2	-2.2	138	135.0	127.5	445.0	400.0	15.00	10.00	.10000	1.00000
2	WEIGHT	183.88	48.15	8.87	97.11	26.2%	20.1	135.7	147	132.0	117.5	710.0	184.0	25.00	15.00	.45359	2.20462
3	GRIP STRENGTH	55.17	6.70	.22	2.67	12.1%	1.9	-1.9	146	41.0	40.5	73.0	55.0	2.00	1.00	1.00000	2.20462
4	STATURE	1769.28	72.21	-.74	7.08	4.1%	-1.7	8..	148	1389.0	1377.5	1956.0	1769.0	25.00	15.00	.10000	.39370
5	CERVICALE HEIGHT	1516.54	60.80	.25	3.01	4.0%	1.0	.5	148	1347.0	1337.5	1675.0	1517.0	15.00	10.00	.10000	.39370
6	ACROMION HEIGHT	1451.22	59.34	.14	3.03	4.1%	.6	.3	148	1278.0	1277.5	1607.0	1451.0	15.00	10.00	.10000	.39370
7	STATURE-CERVICALE	252.74	41.41	-9.69	*****	16.4%	-16.1	175.5	148	-215.0	-227.5	299.0	253.0	25.00	15.00	.10000	.39370
8	HEIGHT/WEIGHT**1/3	312.91	15.17	-3.22	25.15	4.8%	-8.1	38.5	147	198.0	197.5	351.9	313.0	10.00	5.00	.13015	.30250

Figure 2. A summary of material presented by the XVAL program.

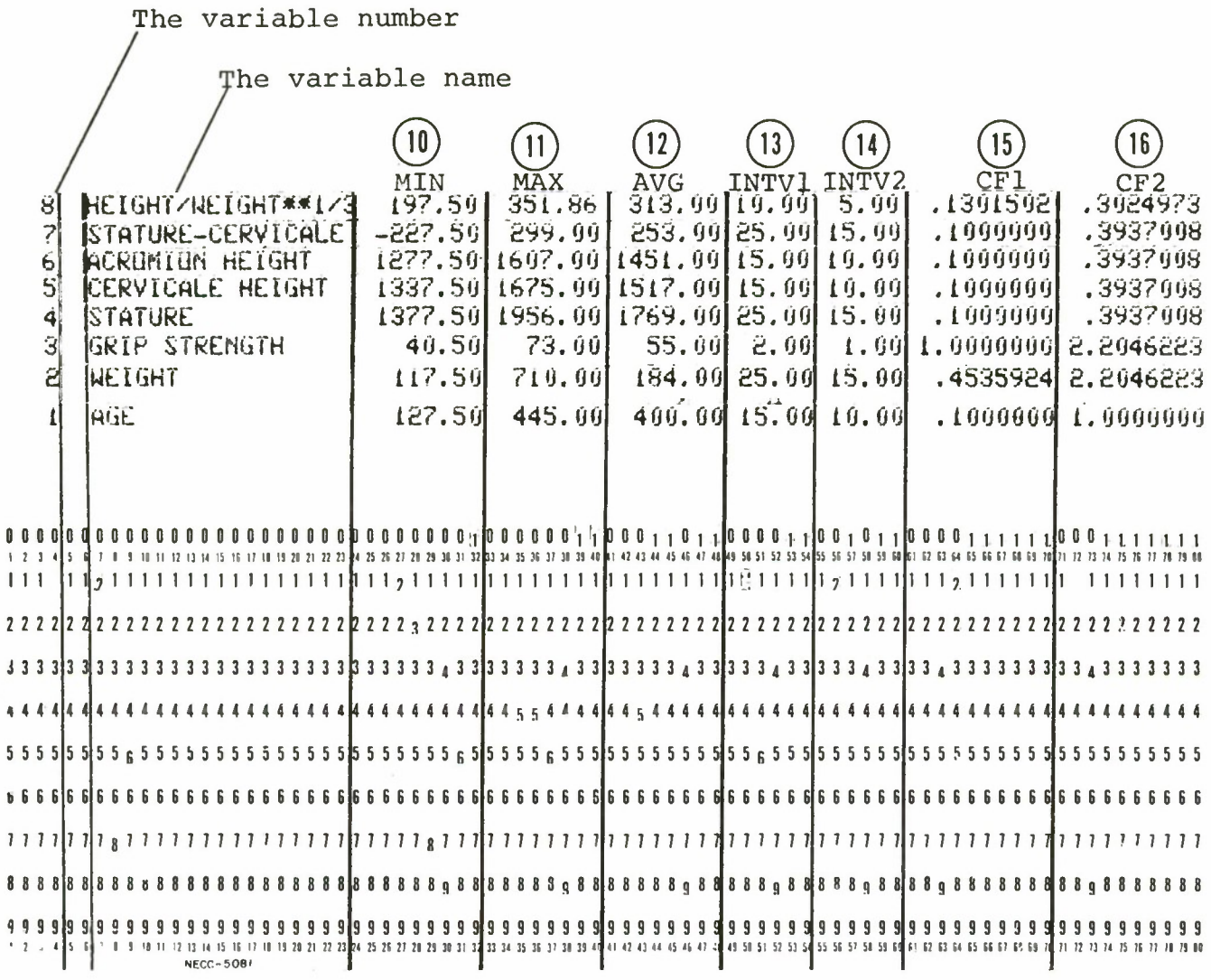


Figure 3. The optional name-range card output for the XVAL program.

The Summary Statistics (continued)	The Optional Punched Name-Range Cards	
(10) MIN -	Columns 25-32:	a value generally slightly smaller than the minimum
(11) MAX -	Columns 33-40:	the maximum value
(12) AVG -	Columns 41-48:	an approximate mean value
(13) INTV1 -	Columns 49-54:	a suggested interval width for frequency tables which are limited to a maximum of 30 intervals
(14) INTV2 -	Columns 55-60:	a suggested interval width for frequency tables which are limited to a maximum of 50 intervals
(15) CF-1 -	Columns 61-70:	a constant for converting the data for that variable to the usual metric units
(16) CF2 -	Columns 71-80:	a constant for converting the data for that variable from the usual metric units to the usual English units

At the bottom of each page of summary statistics, we have again the date, the label for this run, and the page number.

Besides the optional card output, there is also optional printout material consisting of a listing of missing data values; i.e., values read in as zero (Figure 4a), and a listing of missing subject (record) numbers (Figure 4b). The latter actually results from each instance in which a subject number read in is not precisely one more than the previous subject number. Data records not in order, or ones with duplicate subject numbers will trigger listings.

The only other output of program XVAL itself is printing of the namelist XVAL's variable values and messages associated with these values (Figure 5). These values are discussed in detail beginning on page 26.

```
NO VALUES FOR VARIABLE NO.    1, AGE                    FOR RECORDS NO.    30    45    70    85   101   118
NO VALUES FOR VARIABLE NO.    1, AGE                    FOR RECORDS NO.   133   148   163   178
NO VALUES FOR VARIABLE NO.    2, WEIGHT                 FOR RECORDS NO.   120
NO VALUES FOR VARIABLE NO.    3, GRIP STRENGTH          FOR RECORDS NO.    72   142
NO VALUES FOR VARIABLE NO.    8, HEIGHT/WEIGHT**1/3     FOR RECORDS NO.   120
```

a. Missing values list.

```
**NO RECORD BETWEEN     0 AND    15 ----> first subject number is 15
**NO RECORD BETWEEN    16 AND    18 ----> subject number 17 is missing
**NO RECORD BETWEEN    20 AND    19 \
**NO RECORD BETWEEN    19 AND    22 /---> subject number 19 appears again between
**NO RECORD BETWEEN    22 AND    24        subjects 20 and 22
**NO RECORD BETWEEN    46 AND    57
**NO RECORD BETWEEN    81 AND    83
**NO RECORD BETWEEN    83 AND    82
**NO RECORD BETWEEN    82 AND    84
**NO RECORD BETWEEN    95 AND    97
**NO RECORD BETWEEN   104 AND   106
**NO RECORD BETWEEN   113 AND   115
**NO RECORD BETWEEN   124 AND   126
```

b. Missing subjects lists.

Figure 4. Missing values and missing subjects lists.

```
$XVAL
ML      = -1,
MS      = 1,
NR      = 1,
NP      = 45,
NQ      = 25,
XKST    = .1E+00,
YKST    = .3937008E+00,
IP      = 4,
NUNIT   = 4,
$END
ML.NE.0--MISSING VALUE LIST WILL BE PRINTED
MS.GT.0--NON-SEQUENTIAL SUBJECTS WILL BE LISTED
IP.LE.4--FRACTIONAL INTERVALS POSSIBLE
NR.GT.0--NAME RANGE CARDS WILL BE PUNCHED
MAXIMUM NUMBERS OF INTERVALS WILL BE, 45 & 25
```

Figure 5. The namelist XVAL.

Other outputs attributable to subroutines used with XVAL are, in order of appearance, the following:

From subroutine INA77 (Figure 6),

(1) the input control constants of namelist CNTRL
(2) the output label
(3) the name card input format
(4) the data input format
(5) the name card information

From subroutine INB77 (Figure 7),

(1) record number, subject number, and the first NV data
(2) values for the first ten subjects plus every K6th (NV being the number of variables to be processed and K6 as specified by the user or default of 100)
(3) subject number of last subject accepted for processing
(4) number of subjects accepted for processing
(5) number of subjects read in

From subroutine TIPAGE we get the output which immediately precedes the main XVAL printout shown previously as Figure 1,

- a title page (Figure 8)
- a table of contents (Figure 9)

Several elements of the output reflect the effort made in the development of the program to provide signals to indicate the existence of abnormal outlying values. Clues to the "screwball" values can be detected in several places.

The listing of the values themselves will often reveal the most badly recorded or mispunched data. Since it is highly unlikely, if not impossible, that the youngest subject in this survey of military personnel was 13½ years old or that the heaviest subject weighed in excess of 320 pounds, these data suggest the need for (1) checking back to an original source (such as data blanks), (2) further editing techniques or (3) elimination of those values.

Aberrant values can be spotted in large differences between the computed and estimated standard deviations which are suggestive of abnormal values among the extreme 20 values. Gross differences between BOT and TOP warrant examination of the smallest values (if BOT exceeds TOP) or the largest ones (if the reverse is true).

We have found Veta-II, the measure of kurtosis, to be the most sensitive and most useful for data having a more-or-less normal distribution. For such distributions, the measure of kurtosis has a value of about 3. A single abnormal outlyer can raise this value considerably, on occasion almost to its theoretical maximum, N, the sample size. On Figure 1, notice the effect on kurtosis of

```
$CNTRL
NV       = 8,
NH       = 6,
NS       = 77777,
NT       = 5,
K6       = 10,
LN       = 8,
LB       = 1,
LT       = 0,
N1       = 1,
N2       = 1,
NER      = 0,
IER      = 0,
IWHEN    = 1,
IRR      = 77777,
NHDG     = 0,
$END
**
(I4,1X,4A4,A2,7F1.0)
(I4,6F4.0)
```

(1) (2) (3) (4) (5)

--- XVAL TEST ---

**

1	AGE	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
2	WEIGHT	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
3	GRIP STRENGTH	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
4	STATURE	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
5	CERVICALE HEIGHT	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
6	ACROMION HEIGHT	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
7	STATURE-CERVICALE	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000
8	HEIGHT/WEIGHT**1/3	-0.0	-0.0	-0.0	-0.00	-0.00	-0.00000	-0.00000

Figure 6. Subroutine INA77 output.

```
NREC =     1  NSUB =   15
 415.  179.   49. 1711. 1478. 1435.  233.  304.
NREC =     2  NSUB =   16
 415.  710.   52. 1766. 1514. 1427.  252.  198.
NREC =     3  NSUB =   18
 445.  183.   51. 1779. 1536. 1455.  243.  313.
NREC =     4  NSUB =   19
 425.  210.   62. 1860. 1603. 1536.  257.  313.
NREC =     5  NSUB =   20
 395.  210.   64. 1956. 1669. 1607.  287.  329.
NREC =     6  NSUB =   19
 415.  153.   45. 1774. 1512. 1464.  262.  332.
NREC =     7  NSUB =   22
 435.  165.   62. 1734. 1499. 1422.  235.  316.
NREC =     8  NSUB =   24
 445.  187.   63. 1851. 1593. 1496.  258.  324.
NREC =     9  NSUB =   25
 435.  184.   61. 1806. 1551. 1489.  255.  318.
NREC =    10  NSUB =   26
 435.  161.   55. 1710. 1470. 1415.  240.  314.
NREC =    20  NSUB =   36
 415.  164.   55. 1657. 1414. 1349.  243.  303.
NREC =    30  NSUB =   46
 415.  171.   63. 1804. 1552. 1476.  252.  325.
NREC =    40  NSUB =   66
 395.  174.   59. 1819. 1547. 1466.  272.  326.
NREC =    50  NSUB =   76
 345.  168.   58. 1713. 1469. 1397.  244.  310.
NREC =    60  NSUB =   86
 325.  198.   48. 1729. 1497. 1438.  232.  297.
NREC =    70  NSUB =   97
 355.  178.   53. 1799. 1536. 1471.  263.  320.
NREC =    80  NSUB =  108
 355.  183.   50. 1875. 1622. 1553.  253.  330.
NREC =    90  NSUB =  119
 435.  169.   46. 1692. 1436. 1363.  256.  306.
NREC =   100  NSUB =  130
 395.  157.   50. 1783. 1523. 1474.  260.  331.
NREC =   110  NSUB =  140
 405.  201.   57. 1906. 1630. 1566.  276.  325.
NREC =   120  NSUB =  150
 445.  204.   56. 1744. 1503. 1453.  241.  296.
NREC =   130  NSUB =  160
 425.  178.   54. 1781. 1504. 1466.  277.  317.
NREC =   140  NSUB =  170
 435.  186.   54. 1798. 1536. 1462.  262.  315.
***DATA INPUT COMPLETED WITH READING OF RECORD FOR SUBJECT NO.  178. THIS WAS THE  148TH RECORD USED, THE  148TH RECORD READ
```

(1) (2) (3) (4) (5)

Figure 7. Subroutine INB77 output.

A COMPUTER PROGRAM OF
THE CREW STATION INTEGRATION BRANCH
6570TH AEROSPACE MEDICAL RESEARCH LABORATORIES
WRIGHT-PATTERSON AIR FORCE BASE, OHIO
.....
THE ANTHROPOLOGY RESEARCH PROJECT
WEBB ASSOCIATES
YELLOW SPRINGS, OHIO

THE EXTREME VALUE PROGRAM'S COMMENTS REGARDING.....

** --- XVAL TEST --- **

12/21/77

Figure 8. A title page.

THE TABLE OF CONTENTS

Figure 9. A table of contents.

the deviant values for variable 1 (135.0), 2 (710.0), 4 (1389.0), 7 (-215.0) and 8 (198.0 and 251.2).*

PROGRAM CONSTRAINTS

The permissible size of the input data is not limited by the computational processes, but the use of a somewhat compact output format does limit the range of values which may be printed out while preparing a reasonably easy-to-read output. The results are, in the main, listed with up to six digits to the left of the decimal point. However, it will generally make sense to limit the data to four digits to the left of the decimal point by the use of an appropriate input format. Subject (record) numbers are limited by the output to integers with a maximum of five digits.

The maximum number of variables is specified by the user by entering this maximum in the "main program" as the first dimension of the arrays in the first dimension statement (not to exceed the specified dimensions of arrays X, NAY, and A, which currently limit the total number of variables to 205). The number of subjects (or data records) is not limited.

XVAL does not inform its user that a data point is wrong, only that it does not fit the distribution. No alternative value is suggested and therefore some knowledge of the data and/or more intensive data analysis is often required for proper editing.

SOME NOTES

The following notes may be of some value in understanding how the program functions.

Duplicate variable names: The routine which prepares the table of contents will print out any instances of duplicate variable names.

Calculation of summary statistics: The data for any variable are stored until there are 20 of them. The mean of these 20 values is computed, rounded to an integer, and designated as A(I,3). The four summations,

$$S(I,K) = \Sigma(X(I) - A(I,3))^K \text{ for } K=1, 2, 3, \text{ and } 4$$

are computed. Finally,

---

* Age in tenths of years, weight in tenths of kilograms, stature in millimeters.

$$A=S(I,1)/N,\ B=S(I,2)/N,\ C=S(I,3)/N,\ D=S(I,4)/N$$

and,

$$\text{Mean} = A + S(I,3)$$

$$\text{Standard Deviation} = \sqrt{B - A*A}$$

$$\text{Veta I} = (C - 3BA + 2A^3)/(\text{Std Dev})^3$$

$$\text{Veta II} = (D - 4CA + 6BA^2 - 3A^4)/(\text{Std Dev})^4$$

Estimates of mean and standard deviation: For any symmetric distribution--normal or otherwise--the mean of a set of data truncated equally at both ends is itself an unbiased estimate of the mean of the untruncated set. Thus, the mean of the N-20 values is the reported estimate of the mean.

Any truncation, however, will result in a set of data with less variability than the original one. For a distribution of known form, the effect of this truncation can be estimated. Here, we assume a normal distribution, and "correct" the actual deviation computed using the N-20 values by dividing it by

$$\sqrt{1.0124-62.57892/(N+100)-2.57827/\sqrt{N}}$$

Determination of interval widths and "minimum" values: Several programs which are often used for further processing of the data prepare univariate or bivariate frequency tables. These programs require information as to appropriate starting points and interval widths; this information is provided by the values supplied by XVAL on the name-range cards.

Several policy decisions are involved in the way XVAL computes these values. First, the maximum of 50 intervals for univariate and 30 intervals for bivariate tables were chosen on the basis of being, in general, statistically adequate and about as many as were practical if readable printouts of the ultimate tables were to be obtained. (Other maximums can, of course, be specified on the namelist card.)

Secondly, "reasonable" interval widths--say, 20.0 instead of 18.72--were presumed to be desirable. Consistent with the range of most of the data for which the program was developed, 15 possible interval widths are listed in XVAL as array WYD 0.1,0.2, 0.3,0.5,1.0,2.0,3.0,5.0,10.0,15.0,20.,25.,30.,50.,80 and the program selects the smallest of these values which will not require more than the specified maximum number of intervals. The first four (fractional) values are not considered appropriate unless the value of IP in namelist XVAL is otherwise specified. If the largest of these values is not large enough, an interval width which is an integer times 100 is used.

The present selection of possible interval widths can be easily changed by replacing the array WYD.

Third, to minimize the effects of certain types of rounding errors and to cause tables with equal interval widths and overlapping ranges to coincide in their common range, the following conventions have been used in computing the lower limit of each interval for the univariate tables, W being the interval width in computing a maximum 50 intervals, and K an integer:

- W less than 1.0, K = 0.05
- W = 1, 2, or 3, K = 0.5
- W = 5 or more, K = 2.5

The lower limit of the first interval is chosen as the appropriate value of K, below an integer multiple of the interval width, W. Thus, for example, in Figure 2 we see that for "cervicale height" with the range 1347-1675, the interval width is:

$$\frac{1675.0 - 1347.0}{50.} = 6.56$$

gives W = 10.0

134*10 = 1340.0

is the largest multiple of 10 that is less than or equal to 1347.0; thus the chosen bottom of the first interval is:

134*W - K = (A(I,1))

1340.0 - 2.5 = 1337.5

Occasionally, this method of establishing the intervals will require a wider interval than would otherwise be necessary. For example, the range 135-484 could be covered by 50 intervals five units wide (135-139, 140-144, etc.) but XVAL's conventions call instead for intervals 10 units wide (132.5-141.5, 142.5-151.5, etc.) as follows:

$$\frac{484.0 - 135.0}{50} = 4.98 \text{ gives } W = 5$$

27*5. = 135.

135. - 2.5 = 132.5

as the chosen bottom of the first interval. However, the range 484.0-132.5 cannot be covered with 50 intervals of 5., thus the choice of 10. for the interval width.

Intervals for bivariate tables are based on the same initial lower-limits as those determined for the univariate tables.

The "minimum" values as punched on the name-range cards are actually these lower limits and, as such, will almost always be less than the actual minimums of the data. The values punched as the maximums, on the other hand, will be true maximums.

USE OF THE PROGRAM

The "main program" does all the statistical analysis and printing of results. Normally, the only changes that would be made would be to the dimensions of arrays Z, NSN, MISS, and S. The first dimensions of these arrays should all be greater than or equal to the maximum number of variables to be processed. (As previously noted, program XVAL, in its present state, limits the total number of variables to 205.)

The program uses a BLOCK DATA subroutine, a title page and table of contents subroutine (TIPAGE), and the INA77 and INB77 input routines, as well as utility subroutine NUNU99 (see Figure 10 for the deck setup). The contents of common blocks /DATUMS/ and /HEAD/, except for constants NMAX and NPG and array A, must be supplied to the main program before the data processing can take place. In its present state, INA77 and INB77 supply these values as follows:

From INA77 we get,

- WHEN - the date
- HDG - an 80-character label
- NV - the total number of variables to be processed
- NAY - the array containing the 18-character variable names

From INB77 we get, each time it is called,

- NSUB - the subject or record number
- X - the array containing the NV data values for processing

Descriptions of these routines begin on page 40 for INA77 and on page 49 for INB77.

The Input

The data stream is normally in the following form: called from the "main program"--

- the namelist XVAL
- the unit cards, if UNIT was set $\neq 0$ in namelist XVAL

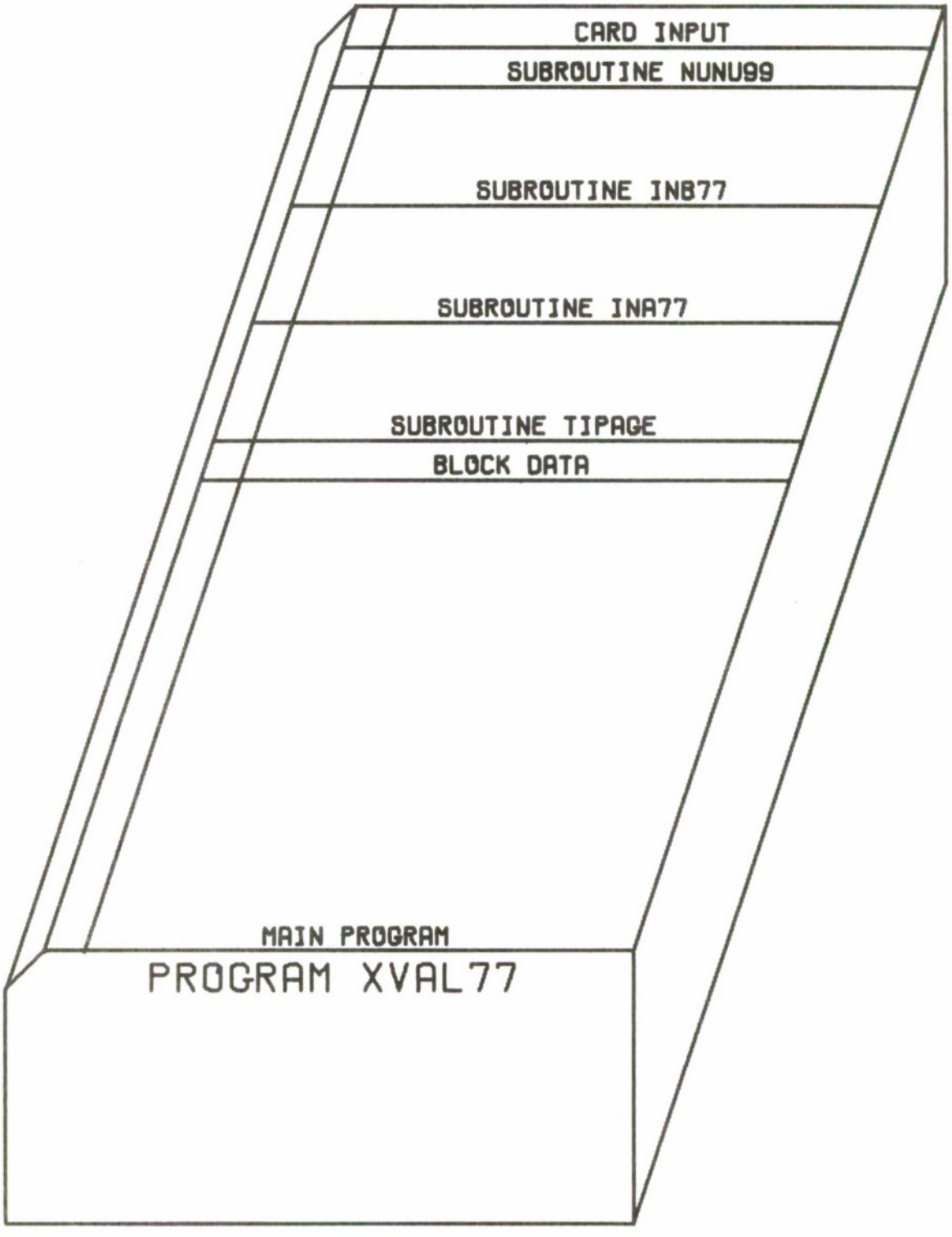


Figure 10. XVAL deck setup.

called from INA77--

- the namelist CNTRL
- a heading card for the survey
- the date, if IWHEN set ≠ 0 in namelist CNTRL
- a format for the name cards if N1 set ≠ 0 in CNTRL
- N2 cards with the format for the data
- finally, the name cards, the last one for variable LN as set in namelist CNTRL

called from INB77--

- for each data set a subject/record number and NW data values read from unit NT
- possibly a pseudo-data record with a negative subject number, or an end-of-file card

The general data deck layout is shown in Figure 11.

The following comments apply to these items:

(1) The namelist XVAL and its default values:

ML - if ≠ 0 missing values are listed. If ML >0, up to ML lines will be printed. If ML <0, there is no limit (default: 0).

MS - if >0, non-consecutive subject numbers are listed (default: 0).

NR - if >0, name-range cards are punched (default: 0).

NP - maximum number of intervals for univariate tables (default: 50).

NQ - maximum number of intervals for bivariate tables (default: 30).

IP - the first value of WYD to be considered (default: 5).

XKST - the usual factor for converting to metric output (default: .1).

YKST - the usual factor for converting from metric to English (default: .3937008).

NUNIT - the number of unit cards (default: 0).

The format of the namelist XVAL is as follows (see Figure 12a):

column 1 - a blank
column 2 - a $*

---

* This symbol is for use of the program on a CDC computer; other computers will have different symbols for this purpose.

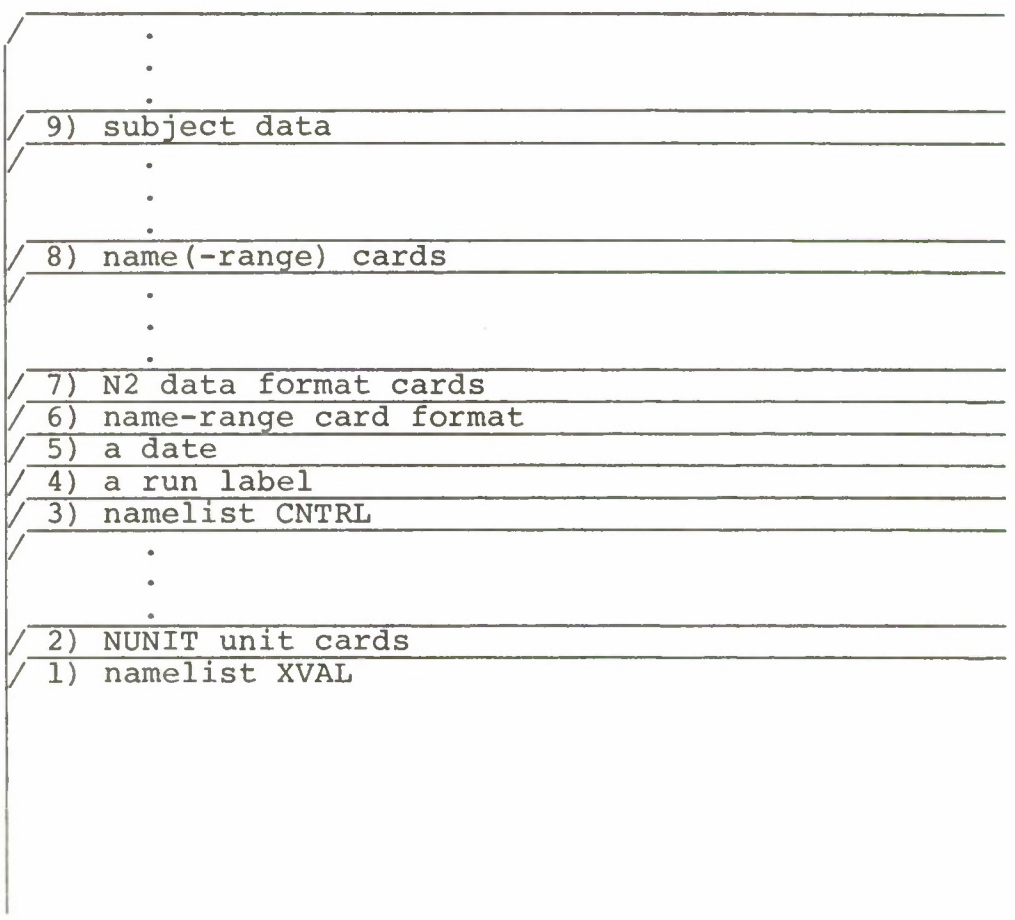
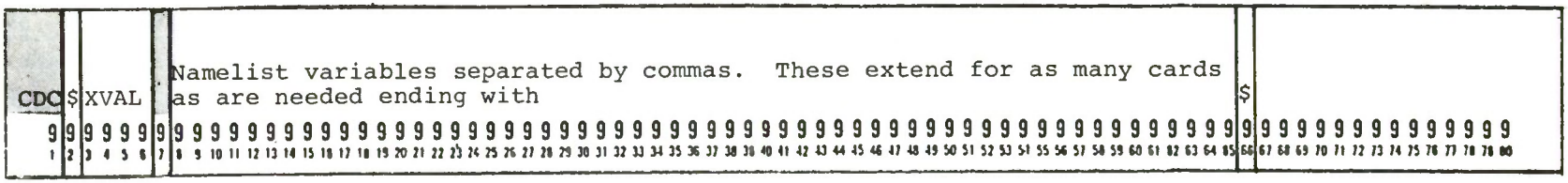
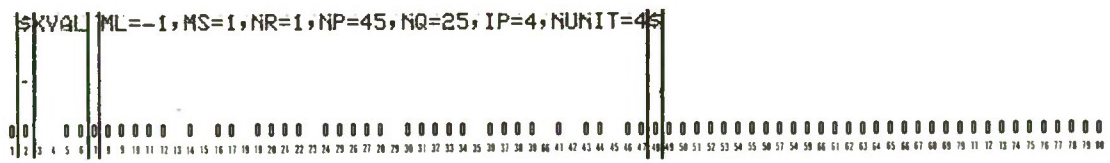


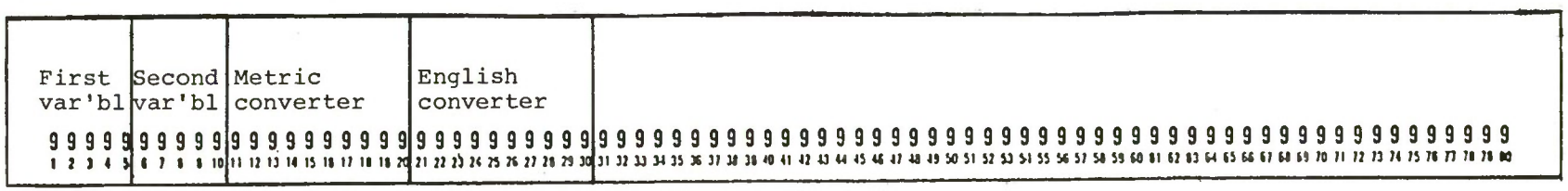
Figure 11. The XVAL input deck.



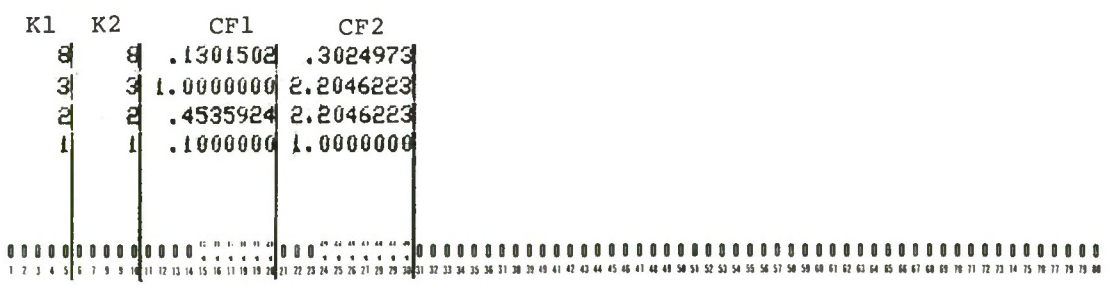
a. The namelist XVAL format.



b. A namelist XVAL example.



c. The unit card format



d. Examples of unit cards.

Figure 12. Program XVAL's input.

columns 3-6 - the word XVAL
column 7 - a blank

After column 7 come none, all, or any combination of the control variables in the form X=4.2,N=13, ... , the last one followed by a $. Note that although imbedded blanks are acceptable, on some machines they will be considered as zeros when they occur between a variable value and the following comma. Thus, a namelist string of the form X=4.2,N=13 ,I=3$ might be interpreted as X=4.2 N=130 I=3.

Figure 12b is the namelist XVAL input which contributed to the previous nine figures as follows:

ML=-1 caused the unlimited missing value list of Figure 4a to be printed

MS=-1 caused the missing subjects list of Figure 4b to be printed

NR=1 caused the punching of the name-range cards of Figure 3

NP=45 and NQ=25 caused the values for INTV1 and INTV2 on Figures 2 and 3 to be calculated for a maximum of 45 and 25 intervals, respectively.

IP=4 would have allowed fractional interval widths beginning with WYD(4) if any of the variables had the appropriate range

NUNIT=4 sets a switch to allow the reading in of four UNIT cards to vary the metric/English conversion factors for the variables specified on these cards

(2) If printing and/or punching of the proper conversion factors is of some concern to the programmer, "unit" cards may be needed. The program automatically assumes all values are in millimeters and desired units are centimeters and inches and assigns 0.1 (XKST) and 0.3937008 (YKST) as conversion factors. If this isn't true, two things can be done: XKST and YKST can be reassigned for all variables in namelist XVAL or XKST and YKST can be changed for specific variables by specifying the appropriate constants on a unit card. For NUNIT $\neq$ 0, NUNIT unit cards are read in,containing on each card MISS(L,1),MISS(L,2),S(L,1), and S(L,2). This says that all variables from variable MISS(L,1) to variable MISS(L,2) will have metric (or primary) conversion constant S(L,1) and English (or secondary) conversion constant S(L,2).

These unit cards are of the form (see Figure 12c):

columns 1-5 MISS(L,1)
columns 6-10 MISS(L,2)

columns 11-20 S(L,1)
columns 21-30 S(L,2)

Figure 12d shows the "unit" cards used to produce the conversion factors (CF1 and CF2) in the summary statistics of Figure 2 and the name-range cards of Figure 3:

- card 1 would convert variable 1, age, in tenths of years to years for primary and secondary units
- card 2 would convert variable 2, weight, in pounds to kilograms for primary units then back to pounds for secondary units
- card 3 would leave variable 3, grip strength, as kilograms for primary units and convert to pounds for secondary units
- card 4 would convert variable 8, height/$\sqrt[3]{\text{weight}}$, to centimeters/$\sqrt[3]{\text{kilograms}}$ from millimeters/$\sqrt[3]{\text{pounds}}$ for primary units, then to inches/$\sqrt[3]{\text{pounds}}$ for secondary units

Variables 4-6 assume the values XKST(0.1) and YKST(0.3937008) converting millimeters to centimeters primarily, and to inches secondarily.

(3) The namelist CNTRL contains various control values for inputting and processing the data (see the INA77 description).

(4) The heading read in is printed out by XVAL on each page of output.

(5) If a date function is not available on the system, or a different date is desired on the printout, a date can be read in here and it appears along with the heading on each printed page. If no date is assigned, the field is filled with blanks.

(6) If no format for the name cards is read in, the standard format (see the INA77 description) is assumed.

(7) The data format should read NSUB as an integer and NW floating point numbers.

(8) The name cards at this point should contain a variable number and a maximum-of-18-characters variable name.

(9) NSUB is the subject/record number, and (X(I),I=1,NW) are the input data.

Three ways are available to specify the number of data records which will be processed:

- The number is given as IRR on the namelist card.
- The end of the data is signalled by the reading of a pseudo-data record with a non-positive value for NSUB. (Note that if each data record consists of H-cards, the pseudo record must also.)
- The end of the data is signalled by the reading of an end-of-file card.

The choice is up to the user.

The Non-array Variables

Variables with preceding *'s refer, in effect, to the I'th variable.

*AWID - a computed univariate - table interval width.

BLANK - a utility variable equal to 4H*^^^.

*BWID - a computed bivariate - table interval width.

*DEL - the lower limit of the table (A(I,1)) is chosen as the [largest multiple of AWID] - DEL which is less than or equal to the minimum value. If AWID is greater than or equal to 5, DEL = 2.5 to minimize rounding errors, and to make interval end points for related variables coincide. If AWID is less than 1., DEL = .05. Otherwise, DEL = .5.

I - a subscript.

IP - the first value of WYD to be considered.

J, JJ, K, KE, KK, KL, KLM, L, LL, M - subscripts.

ML - if not equal to 0, missing values are listed. If ML>0, up to ML lines (6 subject numbers per line) will be printed. If ML<0, there is no limit.

MM - a subscript.

MS - if >0, non-consecutive subject numbers are listed.

NSUB - record number of the previous record.

MX,N - a subscript.

NKQ - a utility variable (= NK(I)-1 for NK(I)<20).

NMAX - the maximum number of variables able to be handled in the current run. It is determined by the "main program" as the first dimension of array Z.

NP - maximum acceptable number of intervals for univariate tables used in computing AWID.

NPG - the current output page number (the table of contents being page 1).

NQ - maximum acceptable number of intervals for bivariate tables used in computing BWID.

NR - if not equal to 0, name-range cards are punched.

NSUB - the current subject number as read in from the data.

NUNIT - the number of unit cards to be read in.

NV - number of variables being processed.

*RANGE - the range of the data.

S2 - a utility variable (=S(L,1)**2).

*UMB - (n-20).

WHY - a utility variable, used in computing EM.

XKST - the usual constant for converting this survey's data to metric output.

*XMID - the range between the tenth largest and tenth smallest data values.

XN - a utility variable (= NK(I)).

YKST - the usual constant for converting this survey's data from the converted metric output to Englist output.

*ZQ - a utility variable (= RANGE/NP).

*Z9 - a utility variable (= Z(I,L)-A(I,3)).

The Array Variables

The dimensioned variables are those listed below. Those dimensions given as 205 can be changed to reflect the number of variables to be processed.

A(205,7) - the constants for the name-range card:

A(I,1) = lower limit of lst interval

A(I,2) = maximum

A(I,3) = approximate mean

A(I,4) = bivariate table interval width

A(I,5) = univariate table interval width

A(I,6) = metric conversion constant

A(I,7) = English conversion constant

APE(14) - storage array for some output headings.

BOT(1) - equivalenced with MISS(1,5), it contains a measure of the variation within the ten smallest values.

CST(205,2) - metric and English conversion factors (equivalenced with A(I,6)).

EM (1), ESD (1) - equivalenced with MISS(1,1) and MISS(1,2), they contain the mean of the mid n-20 values and the standard estimate from these values.

HDG(20) - a suitable heading for the survey.

MISS(205,6) - MISS(I,J) is the record number for the K-th record containing a zero value for X(I) (J=K mod 6). MISS actually uses cells committed to EM, ESD, V, TOP, BOT, MQ, variables not used until values of MISS are listed.

MQ(1) - the number of stored values of MISS.

NAY(205,5) - (NAY(I,J), J=1,5) is a maximum 18-character name for variable I.

NK(1) - equivalenced with S(1,5), it contains the number of processed values of X(I).

NSN(205,20) - NSN(I,J) is the record number associated with Z(I,J).

S(205,5) - (S(I,J), J=1,4) contains the summations for (X-A(I,3)) to the J-th power for variable I. Eventually the mean, standard deviation, and the measures of skewness and kurtosis are stored here. S(I,5) contains the sample size for variable I.

TOP(1) - equivalenced with MISS(1,4), it contains a measure of the variation within the ten largest values.

V(1) - equivalenced with MISS(1,3), it contains the coefficient of variance for each variable.

WHEN(2) - the date.

WYD(15) - a list of acceptable interval widths.

X(205) - the basic data for each subject.

Z(205,20) - the ten largest and ten smallest values for each variable in descending order.

THE SUBROUTINES

As noted earlier, the subroutines supply the contents of the common blocks /DATUMS/ and /HEAD/, except for constants NMAX and NPG and array A. Also included in the subroutines are a title page and table of contents (TIPAGE), input routines INA77 and INB77, and utility subroutine NUNU99. These subroutines are used for data initialization and some preliminary analysis of the data.

Subroutine BLOCK DATA

The BLOCK DATA subroutine provides default values and initial values to subroutine INA77 and INB77 as follows:

```
      BLOCK DATA                                                        DATA  10
      COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   DATA  20
      COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                          DATA  30
      DATA ISUE,INK,WHEN/-1,0,2*4H    /                                 DATA  40
      DATA NL/2*0,77777,5,100,0,1,777,0,1,4*0,1492,0/                   DATA  50
      DATA F1/4H (I4,4H,2X,,4H4A4,,4HA2,3,4HF8.2,4H,2F6,4H.2,2,4HF10.,2HDATA  60
     *7),11*1H /                                                        DATA  70
      END                                                               DATA  80
```

ISUE - in INB77 it counts the number of subject data sets read in. (Initially = -1)

INK - in INB77 it counts the number of subject data sets passed to the main program. (Initially = 0)

WHEN - the date is initialized to blanks.

NL(20) - this array contains many of the control constants used by the subroutines as well as the main program. Its members are equivalenced and (assigned) as follows:

NL(1) - not used.

NL(2) = NW - total number of variables (0).

NL(3) = NS - total number of subjects to be read in (77777).

NL(4) = NT - the data unit from which the subject data are to be taken (5).

NL(5) = K6 - after printing out the first 10 subjects' data, INB77 prints out every K6th subject's data (100).

NL(6) = LN - the variable number of the last name card to be read in (0).

NL(7) = LB - number of the first variable to be checked for out-of-range data by INB77 (1).

NL(8) = LT - number of the last variable to be checked for out-of-range data by INB77 (0).

NL(9) = N1 - number of cards to be read in containing the format of the name cards (0).

NL(10) = N2 - number of cards to be read in containing the format of the data (1).

NL(11) = NER - acceptable number of records with one or more out-of-range values (0).

NL(12) = IER - code for treatment of out-of-range values by INB77 (0).

NL(13) = IWHEN - if not equal to 0, the date (WHEN) is read in (0).

NL(14) = IRR - the total number of subject data records to be processed (0).

NL(15) = not used.

NL(16) = KEEP - a constant used for sorting out unwanted subject data records (1492).

NL(17) = NHDG - not used.

F1(20) - this array contains the default input format for the name cards (I4,2X,4A4,A2,3F8.2,2F6.2,2F10.7).

Subroutine TIPAGE

This routine contributes three basic outputs:

- a listing of duplicate variable names, if any (Figure 13)
- a title page (Figure 14)
- a table of contents (Figure 15)

As soon as data initialization is completed, this routine begins comparing variable names starting with the first two names. Array K is used to store the alphabetic order of the variable names. When the order of the first two variables is complete, variable 3 is compared with the first two in alphabetic order. Testing is

```
NREC =     9  NSUB =    25
 435.  184.   61. 1806. 1551. 1489.  255.  318.
NREC =    10  NSUB =    26
 435.  161.   55. 1710. 1470. 1415.  240.  314.
NREC =    20  NSUB =    36
 415.  164.   55. 1657. 1414. 1349.  243.  303.
NREC =    30  NSUB =    46
 415.  171.   63. 1804. 1552. 1476.  252.  325.
NREC =    40  NSUB =    66
 395.  174.   59. 1819. 1547. 1466.  272.  326.
NREC =    50  NSUB =    76
 345.  168.   58. 1713. 1469. 1397.  244.  310.
NREC =    60  NSUB =    86
 325.  198.   48. 1729. 1497. 1438.  232.  297.
NREC =    70  NSUB =    97
 355.  178.   53. 1799. 1536. 1471.  263.  320.
NREC =    80  NSUB =   108
 355.  183.   50. 1875. 1622. 1553.  253.  330.
NREC =    90  NSUB =   119
 435.  169.   46. 1692. 1436. 1363.  256.  306.
NREC =   100  NSUB =   130
 395.  157.   50. 1783. 1523. 1474.  260.  331.
NREC =   110  NSUB =   140
 405.  201.   57. 1906. 1630. 1566.  276.  325.
NREC =   120  NSUB =   150
 445.  204.   56. 1744. 1503. 1453.  241.  296.
NREC =   130  NSUB =   160
 425.  178.   54. 1781. 1504. 1466.  277.  317.
NREC =   140  NSUB =   170
 435.  186.   54. 1798. 1536. 1462.  262.  315.
***OATA INPUT COMPLETED WITH REAOING OF RECORD FOR SUBJECT NO.  178. THIS WAS THE  148TH RECORD USEO, THE  148TH RECORO READ
**NO RECORD BETWEEN      0 AND     15
**NO RECORD BETWEEN     16 ANO     18
**NO RECORD BETWEEN     20 AND     19
**NO RECORO BETWEEN     19 AND     22
**ND RECORD BETWEEN     22 AND     24
**NO RECORO BETWEEN     46 AND     57
**ND RECORD BETWEEN     81 AND     83
**ND RECORD BETWEEN     83 ANO     82
**ND RECORD BETWEEN     82 AND     84
**NO RECORD BETWEEN     95 AND     97
**ND RECORD BETWEEN    104 ANO    106
**ND RECORD BETWEEN    113 ANO    115
**ND RECORD BETWEEN    124 ANO    126
NO VALUES FOR VARIABLE NO.    1, AGE                 FOR RECORDS NO.    30    45    70    85   101   118
ND VALUES FOR VARIABLE NO.    1, AGE                 FOR RECORDS ND.   133   148   163   178
NO VALUES FOR VARIABLE NO.    2, AGE                 FOR RECORDS ND.   120
ND VALUES FOR VARIABLE NO.    3, GRIP STRENGTH       FOR RECORDS ND.    72   142
ND VALUES FOR VARIABLE NO.    8, HEIGHT/WEIGHT**1/3 FOR RECORDS NO.   120

 DUPLICATE NAMES VARIABLES    1 AND    2 ARE NAMED  AGE

 DUPLICATE NAMES VARIABLES    4 AND    7 ARE NAMEO  STATURE
```

Figure 13. The duplicate variable names.

A COMPUTER PROGRAM OF
THE CREW STATION INTEGRATION BRANCH
6570TH AEROSPACE MEDICAL RESEARCH LABORATORIES
WRIGHT-PATTERSON AIR FORCE BASE, OHIO
.....
THE ANTHROPOLOGY RESEARCH PROJECT
WEBB ASSOCIATES
YELLOW SPRINGS, OHIO

THE EXTREME VALUE PROGRAM'S COMMENTS REGARDING.....

** --- XVAL TEST --- **

12/21/77

Figure 14. A title page.

THE TABLE OF CONTENTS

Figure 15. A table of contents.

only done until the proper alphabetic order is found. Array K is then reordered and comparisons begin for the next variable.

When the alphabetizing of the variable names is complete (the duplicate names being printed as they are encountered while alphabetizing), a title page and a table of contents are printed. Control is then returned to the main program.

TIPAGE uses variable NV and arrays NAY, HDG, and WHEN to complete its task and returns the page number (NPG) of the last page of the table of contents to the main program.

The Non-array Variables.

I, ILESS1 - subscripts.

I1 &I3 - calculated page numbers for statistics are stored here for printing.

I2 - calculated page number of the first page of the summary statistics.

I5 - calculated page number of the first page of the statistics following the table of contents.

J - a subscript.

JL - the number of variable numbers to be updated in array K when another variable name has been added alphabetically.

J96 - the difference between the number of printed lines on the last page of a table of contents. This is used to space the labelling to the bottom of the last page.

KG - the number of variables to be included on the left side of the current table of contents page.

KK,L - subscripts.

LK - variable number of the variable name currently being printed on the right side of the page.

M - a subscript

N - number of variables to be printed on the current page.

NM - a subscript.

NMAX - not used here.

NPG - the current page number.

NPP - the number of variables per page of regular statistical output.

NSUB - not used here.

NV - the number of variable names to be processed.

The Array Variables.

A(205,7) - not used here.

HDG(20) - an 80-character label.

K(205) - the variable numbers are stored here in the order of the alphabetic arrangement of the names.

NAY(205,5) - the maximum 18-character variable names.

WHEN(2) - the date.

X(205) - array K uses the space allocated to array X during the execution of this routine.

Subroutine INA77

This routine brings in the control constants used in all the other routines, as well as formats, a heading, and variable name-range information.

The Input.

This input routine reads in:

- a list of program parameters (Figure 16a).
- a header label for use in the ultimate output (Figure 16b).
- possibly a date for labelling the output (Figure 16c).
- possibly a format for reading in the variable name-range information (Figure 16d).
- the data format (Figure 16e).
- the variable names and perhaps some range and data conversion information (Figure 16f).

The program parameters are read in using a NAMELIST. The first card providing these constants begins ^$CNTRL. All cards must be blank in column 1, and the list must end with a dollar sign (see Figure 17). Between the indicated beginning and end, any variable on the NAMELIST can be specified in the form:

NV = 13

Such specifications are separated by commas. (NOTE: blanks immediately following a constant value are interpreted by some machines as zeros. This NV=13^, would give NV a value of 130 on some

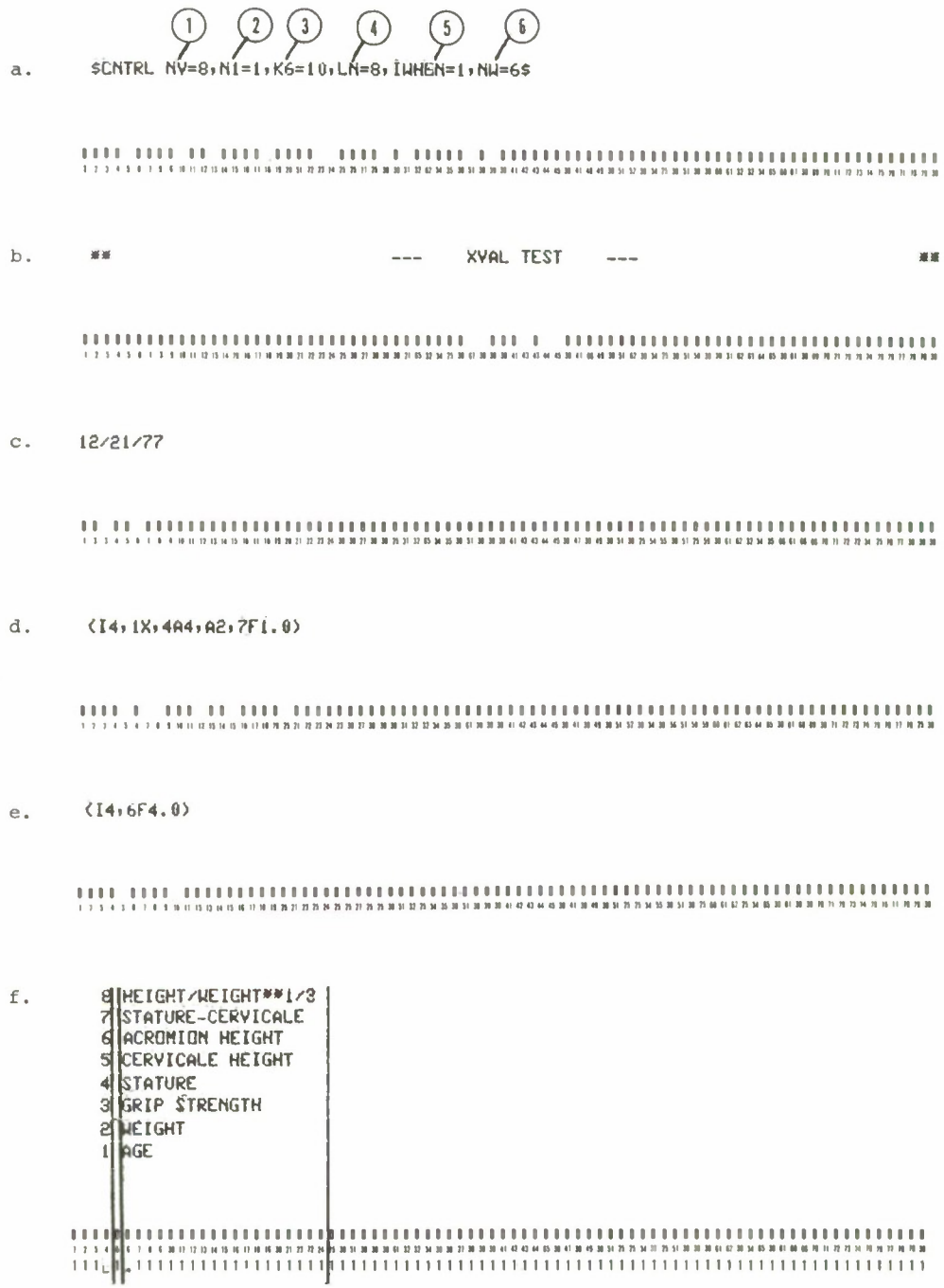


Figure 16. The INA77 input.

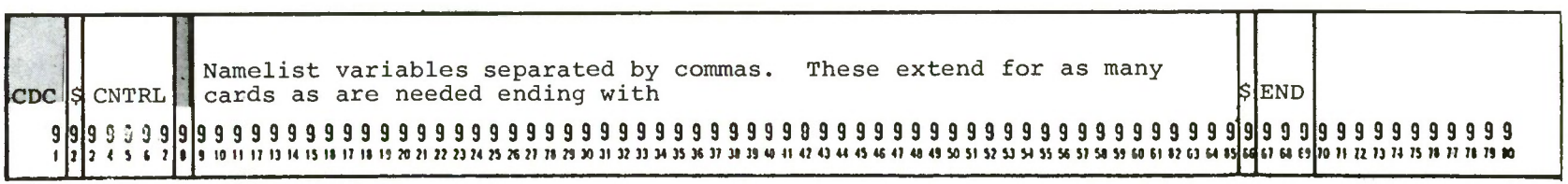


Figure 17. The namelist CNTRL format.

machines.) They do not have to occur in any special order, and any combination of the listed parameters--from one to all--may be included.

The listed parameters are these:

NV = the number of variables to be processed.
Default value:NW.

NW = the number of variables in each data record.
Default value:NV. (Ordinarily, it is possible for NV to equal, be greater than, or be less than NW.)

NS: number of data records to be read in. If no value for NS is specified, the program will continue until either an end-of-file is encountered or a pseudo-data record with a negative subject number is read. Actual default values:77777.

K6: the input lists the first and every (K6)th data record. Default value:100.

NT: the designated unit number the actual subject data values are to be read from. Default value:5 (this generally denotes card input).

LB,LT,NER,IER: these four constants control the checking that the data lie within the appropriate ranges.

- Values of X(I) for LB≤I≤LT are checked. If LT=0, no checking is done. Default values:LB=1,LT=0.
- The program aborts if the number of records containing one or more out-of-range values exceeds NER. Default value:0.
- The action taken by the program on finding an out-of-range value is specified by IER:

  - IER=0. The record containing the faulty value is passed over.
  - IER=1. The faulty value is replaced by zero.
  - IER>1. The faulty value is replaced by the approximate mean value (A(I,3)).

N1: if not equal to zero, a format card for the name-range information is read. Otherwise, the format (I4,2X,4A4, A2,3F8.2,2F6.2,2F10.7) is implied. Default value:0.

N2: the number of format cards for reading the data. Default value:1. Maximum=5.

LN: if any name-range cards are to be read in, LN is the variable number of the physically last such card. (A

convenient value is 1 - with the card for variable #1 put at the back of the group of cards.) Default value: MAX(NV,NW).

IWHEN: on some machines the date stored in array WHEN can be assigned by calling an intrinsic function. However, when a date other than the current one is desired or no such function exists (as on our IBM machine), a value of IWHEN not equal to zero will trigger the program to read the date in. Array WHEN is initially set to Hollerith blanks. Default value:0.

IRR = the total number of subject data records to be processed. Default value:NS.

NHDG: not used.

Figure 16a shows the input namelist CNTRL card which contributed to the outputs of Figures 1-9 as follows:

(1) The number of variables to be processed, NV, equals 8.

(2) N1=1 causes the reading of the name card format of Figure 16d.

(3) Subject data printout will consist of the first 10 subjects' data plus every 10th (K6th) as seen in Figure 7.

(4) LN=8 implies that variable name-range cards will be read in until variable 8 is encountered, thus the input of Figure 16f.

(5) IWHEN=1 calls for the reading in of the date of Figure 16c.

(6) NW=6 says that six pieces of data will be read in for each subject.

The label card: Columns 1-80 contain the alphabetic array HDG which becomes available for various labelling uses. For maximum aesthetics, the label should probably be centered in this field.

A date: If IWHEN is set not equal to zero, a date is read in from the first 8 columns of the card.

The format: Format statements to be read in follow the usual rules for format statements included within a program except that the word FORMAT does not appear, and all 80 columns are available for use. If N1 is not equal to 0, there should be one card with the name-range card format, followed by N2 cards with the data format.

The name-range cards: At least one card must be read in with a legitimate variable number. The maximum variable number is 205. Name-range cards are read in until a variable number equal to constant LN is read. Any part or all of the following information can be included here (see Figure 18):

columns 1 - 4	the variable number (I4)
columns 7 - 24	the variable name (4A4,A2)
columns 25 - 32	a value slightly less than or equal to the minimum (F8.2)
columns 33 - 40	the maximum (F8.2)
columns 41 - 48	the approximate mean value (F8.2)
columns 49 - 54	a suitable interval width for univariate tables (F6.2)
columns 55 - 60	a suitable interval width for bivariate tables (F6.2)
columns 61 - 70	a constant to convert the data to the usual metric units/cm, kg, years (F10.7)
columns 71 - 80	a constant to convert the data from the usual metric units to English units/inches, pounds, years (F10.7)

The XVAL program, while it generates these values, does not use them; they are, however, commonly used in preparing univariate and bivariate frequency tables and in a number of other programs. The column numbers mentioned reflect the default format for this input as well as the actual format of the optional name-range card output of the main program. However, this input is accepted by INA77 in any form as long as a suitable format statement is also read in (see Figures 16d and 16f).

The Non-array Variables.

IER - initiated for use by INB77.

INK, IRR, ISUE - initiated for use by INB77.

IWHEN - if set not equal to zero in the namelist, INA77 reads in a date.

J - a subscript.

KEEP, K6 - initiated for use by INB77.

L - a subscript.

LB - initiated for use by INB77.

LN - number of the physically last name-range card.

LT - initiated for use by INB77.

NER - initiated for use by INB77.

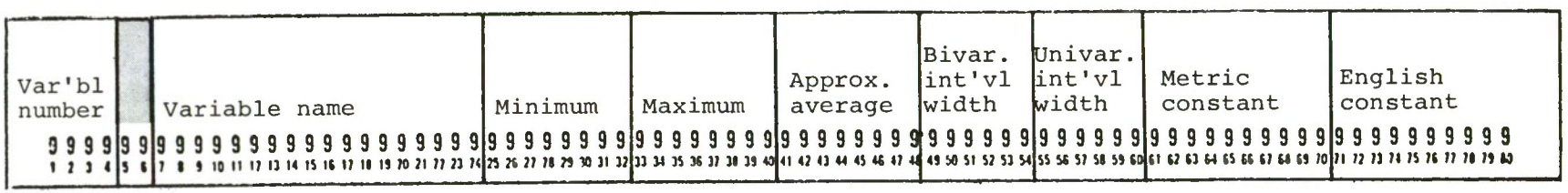


Figure 18. The name-range card format

NF2 - equals 20 times N2 and represents the number of words of the data format read in.

NHDG - not used.

NMAX - the maximum allowable number of variables.

NPG - not used.

NS - initiated for use by INB77.

NSUB - not used.

NT - initiated for use by INB77.

NV - the number of variables to be processed.

NW - initiated for use by INB77.

N1 - if N1 is set not equal to zero, a format for reading in the name-range cards is read in.

N2 - the number of format cards to be read in for use in reading the subject data.

The Array Variables.

The dimensioned variables are those listed below. Those dimensions given as 205 can be changed to reflect the number of variables to be processed.

A(205,7) - the constants which might appear on the name-range cards:

A(I,1) = lower limit of 1st interval,

A(I,2) = maximum,

A(I,3) = approximate mean,

A(I,4) = bivariate table interval width,

A(I,5) = univariate table interval width,

A(I,6) = metric conversion constant,

A(I,7) = English conversion constant.

F1(20) - the name-range card input format.

F2(20) - the subject data input format.

HDG(20) - a suitable heading for the survey,

NAY(205,5) - (NAY(I,J), J=1,5) is a maximum 18-character name for variable I.

NL(20) - this array contains many of the control constants used by the subroutines as well as the main program. Its members are equivalenced and assigned as follows:

NL(1) = not used,

NL(2) = NW - total number of variables,

NL(3) = NS - total number of subjects to be read in,

NL(4) = NT - the data unit from which the subject data are to be taken,

NL(5) = K6 - after printing out the first ten subjects' data, INB77 prints out every K6th subject's data,

NL(6) = LN - the variable number of the last name card to be read in,

NL(7) = LB - number of the first variable to be checked for out-of-range data by INB77,

NL(8) = LT - number of the last variable to be checked for out-of-range data by INB77,

NL(9) = N1 - number of cards to be read in containing the format of the name cards,

NL(10) = N2 - number of cards to be read in containing the format of the data,

NL(11) = NER - acceptable number of records with one or more out-of-range values,

NL(12) = IER - code for treatment of out-of-range values by INB77,

NL(13) = IWHEN - if not equal to 0, the date (WHEN) is read in,

NL(14) = IRR - the total number of subject data records to be processed,

NL(15) = KEEP - a constant used for sorting out unwanted subject data records,

NL(16) = NHDG - not used.

WHEN(2) - the date.

X(205) - the basic data for each subject are read into array X by subroutine INB77.

Subroutine INB77

The Input.

This is our basic data input routine and expects data of the form NSUB,(X(I),(I=1,NW), where NSUB is a subject/record number and X(I) is the value of the I'th variable for subject number NSUB. Figure 19 shows the form of the data used in generating Figures 1-4 and 7 as read in by the format of Figure 16a. Note that the last card is blank; thus, NSUB will be read as zero and reading of the data will terminate.

Data Manipulation.

For each data record, this routine reads in the data record and, usually, transmits the record to the calling program after it does one or more of the following:

- makes any necessary data changes through a call to subroutine NUNU99,
- the first ten records plus every K6th are listed as specified,
- if LT was assigned in the namelist XVAL, each datum from variable LB to variable LT is checked to see that it falls within the range specified on the name-range cards read in from subroutine INA77. When a value outside that range is detected and the number of allowable records with out-of-range values (NER) has not been exceeded, one of three things can happen, depending on the value of IER:

  - if IER=0, the record is rejected and a new one used,
  - if IER=1, the out-of-range value is set equal to zero,
  - if IER>1, the value is set equal to the approximate mean value for that variable (A(I,3)).

Note that the third step above is taken only if the relevant program parameter is set. The first step constitutes a call to subroutine NUNU99 which routinely does nothing except return control to INB77. It is in this routine that we fabricate new variables or eliminate data records by inserting sections of program code (for examples, see description of NUNU99).

The Non-array variables.

I - a subscript.

IER - code for treatment of out-of-range values.

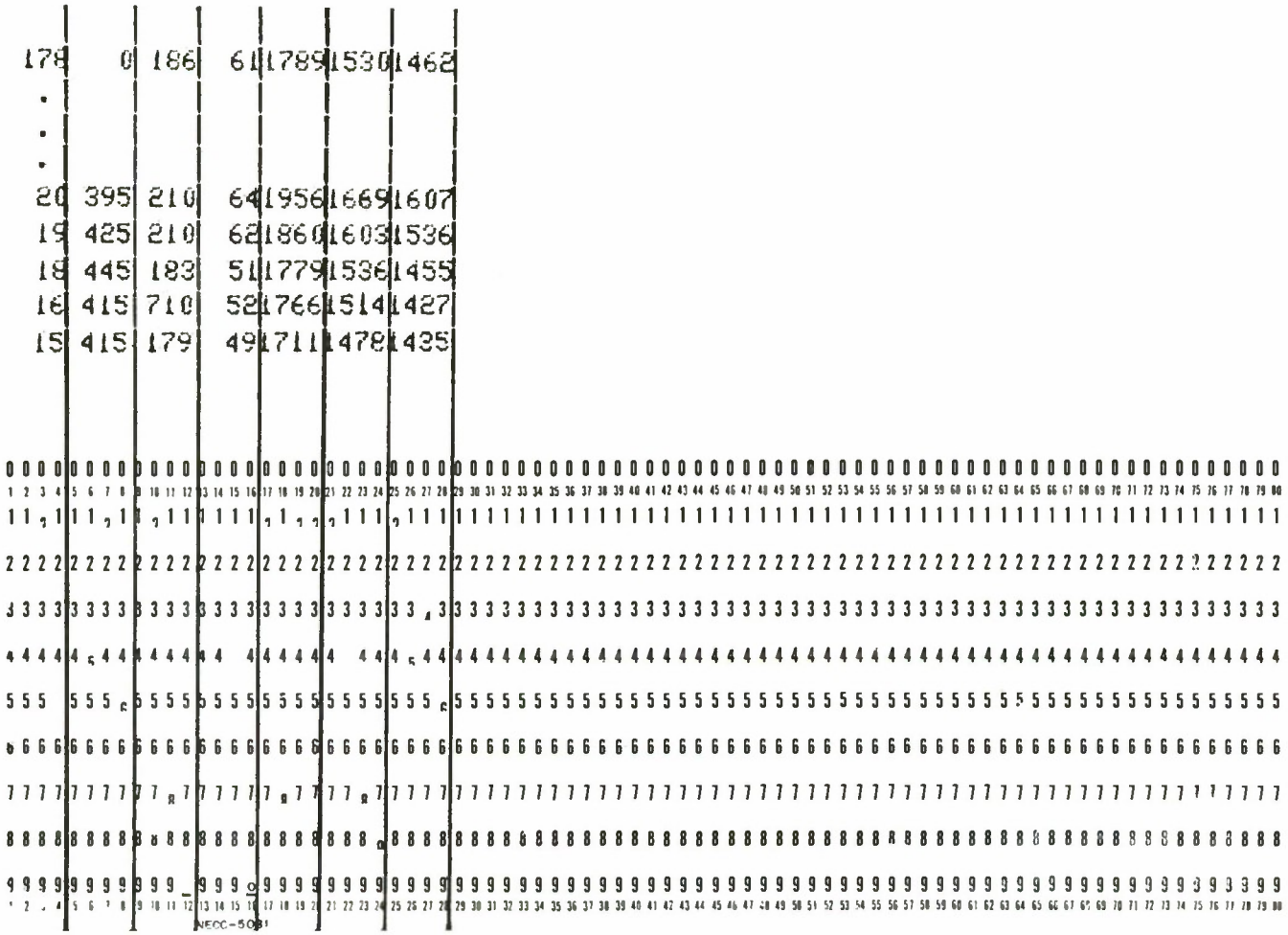


Figure 19. Subroutine INB77 input.

INK - counter that keeps track of the number of subject data records processed.

IRR - the total number of subject data records to be processed.

ISUE - counter that keeps track of the number of subject data records read in.

IWHEN - used by INA77.

K - a subscript.

KEEP - a constant equal to 1492 used in conjunction with NUNU99 for eliminating entire sets of subject data.

K6 - after printing out the first ten subjects' data, INB77 prints out every K6th subject's data.

L - a subscript.

LB - number of the first variable to be checked for out-of-range data.

LN - used by INA77.

LT - number of the last variable to be checked for out-of-range data.

MSUB - record number of the previous record.

MX - utility variable.

NER - acceptable number of out-of-range values.

NHDG - not used.

NMAX - the maximum number of variables which can be handled in the current run. It is determined by the "main program" as the first dimension of array Z.

NPG - used by XVAL and TIPAGE.

NS - total number of subjects to be read in.

NSUB - subject number of the current data record.

NT - the data unit from which the subject data are to be taken.

NV - the number of variables to be printed out by INB77, and processed by XVAL.

NW - the number of pieces of data to be read in.

N1,N2 - used by INA77.

The Array Variables.

The dimensioned variables are those listed below. Those dimensions given as 205 can be changed to reflect the number of variables to be processed.

A(205,7) - the constants which might appear on the name-range cards:

A(I,1) = lower limit of first interval,

A(I,2) = maximum,

A(I,3) = approximate mean,

A(I,4) = bivariate table interval width,

A(I,5) = univariate table interval width,

A(I,6) = metric conversion constant,

A(I,7) = English conversion constant.

F1(20) - the name-range card input format.

F2(20) - the subject data input format.

HDG(20) - a suitable heading for the survey.

NAY(205,5) - (NAY(I,J), J=1,5) is a maximum 18-character name for variable I.

NL(20) - this array contains many of the control constants used by the subroutines as well as the main program. Its members are equivalenced as follows:

NL(1) = not used,

NL(2) = NW - total number of variables,

NL(3) = NS - total number of subjects to be read in,

NL(4) = NT - the data unit from which the subject data are to be taken,

NL(5) = K6 - after printing out the first ten subjects' data, INB77 prints out every K6th subject's data,

NL(6) = LN - the variable number of the last name card to be read in,

NL(7) = LB - number of the first variable to be checked for out-of-range data by INB77,

NL(8) = LT - number of the last variable to be checked for out-of-range data by INB77,

NL(9) = N1 - number of cards to be read in containing the format of the name cards,

NL(10) = N2 - number of cards to read in containing the format of the data,

NL(11) = NER - acceptable number of records with one or more out-of-range values,

NL(12) = IER - code for treatment of out-of-range values by INB77,

NL(13) = IWHEN - if not equal to 0, the date (WHEN) is read in,

NL(14) = IRR - the total number of subject data records to be processed,

NL(15) = KEEP - a constant used for sorting out unwanted subject data records,

NL(16) = NHDG - not used.

WHEN(2) - the date.

X(205) - the basic data for each subject.

Subroutine NUNU99

This subroutine's function is to make changes in the data. It routinely does nothing except return control to INB77 (see Figure 20). It is in this routine that we fabricate new variables, after the regular variables, or eliminate data records by inserting sections of program code.

Figure 21a shows the version of NUNU99 which contributed to the output of Figures 1-4 and 7. Although only six pieces of data were read in for each subject by INB77, NUNU99 has created variables 7 and 8. Figure 21b shows NUNU99 creating these same two variables, plus:

```
      SUBROUTINE NUNU99 (KEEP)                                          NUNU  10
C-----                                                                  NUNJ  20
C... THIS SUBROUTINE'S FUNCTION IS FOR MAKING CHANGES IN THE DATA.  IT  NUNU  30
C    ROUTINELY DOES NOTHING EXCEPT RETURN CONTROL TO INB77.  IT IS IN   NUNJ  40
C    THIS ROUTINE THAT WE FABRICATE NEW VARIABLES, AFTER THE REGULAR    NUNU  50
C    VARIABLES, OR ELIMINATE DATA RECORDS BY INSERTING SECTIONS OF      NUNJ  60
C    PROGRAM CODE.                                                      NUNU  70
C                                                                       NUNU  80
C-----                                                                  NUNJ  90
C... WHEN MAKING AN XVAL RUN, THIS ROUTINE SHOULD ALWAYS BE CHECKED TO  NUNJ 100
C    INSURE NO UNWANTED DATA CHANGES FROM A PREVIOUS RUN REMAIN.        NUNU 110
C-----                                                                  NUNJ 120
C                                                                       NUNJ 130
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             NUNJ 140
C-----                                                                  NUNU 150
C.....IF KEEP .NE.1492, THE RECORD JUST READ IS IGNORED                 NUNJ 160
C                                                                       NUNU 170
      KEEP=1492                                                         NUNJ 180
      RETURN                                                            NUNJ 190
      END                                                               NUNJ 200
```

Figure 20. Subroutine NUNU99.

```
      SUBROUTINE NUNU99 (KEEP)                                          NUNU  10
C-----                                                                  NUNU  20
C... THIS SUBROUTINE'S FUNCTION IS FOR MAKING CHANGES IN THE DATA.  IT  NUNU  30
C    ROUTINELY DOES NOTHING EXCEPT RETURN CONTROL TO INB77.  IT IS IN   NUNU  40
C    THIS ROUTINE THAT WE FABRICATE NEW VARIABLES, AFTER THE REGULAR    NUNU  50
C    VARIABLES, OR ELIMINATE DATA RECORDS BY INSERTING SECTIONS OF      NUNU  60
C    PROGRAM CODE.                                                      NUNU  70
C                                                                       NUNU  80
C-----                                                                  NUNU  90
C... WHEN MAKING AN XVAL RUN, THIS ROUTINE SHOULD ALWAYS BE CHECKED TO  NUNU 100
C    INSURE NO UNWANTED DATA CHANGES FROM A PREVIOUS RUN REMAIN.        NUNU 110
C-----                                                                  NUNU 120
C                                                                       NUNU 130
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             NUNU 140
C-----                                                                  NUNU 150
C.....IF KEEP .NE.1492, THE RECORD JUST READ IS IGNORED                 NUNU 160
C                                                                       NUNU 170
      KEEP=1492                                                         NUNU 180
      X(7)=X(4)-X(5)
      IF(X(4).EQ.0..OR.X(5).EQ.0.)X(7)=0.
      IF(X(4).EQ.0..OR.X(2).EQ.0.)X(8)=0.
      IF(X(4).EQ.0..OR.X(2).EQ.0.)RETURN
      X(8)=X(4)/X(2)**(1./3)
      RETURN                                                            NUNU 190
      END                                                               NUNU 200
```

a.

```
      SUBROUTINE NUNU99 (KEEP)                                          NUNU  10
C-----                                                                  NUNU  20
C... THIS SUBROUTINE'S FUNCTION IS FOR MAKING CHANGES IN THE DATA.  IT  NUNU  30
C    ROUTINELY DOES NOTHING EXCEPT RETURN CONTROL TO INB77.  IT IS IN   NUNU  40
C    THIS ROUTINE THAT WE FABRICATE NEW VARIABLES, AFTER THE REGULAR    NUNU  50
C    VARIABLES, OR ELIMINATE DATA RECORDS BY INSERTING SECTIONS OF      NUNU  60
C    PROGRAM CODE.                                                      NUNU  70
C                                                                       NUNU  80
C-----                                                                  NUNU  90
C... WHEN MAKING AN XVAL RUN, THIS ROUTINE SHOULD ALWAYS BE CHECKED TO  NUNU 100
C    INSURE NO UNWANTED DATA CHANGES FROM A PREVIOUS RUN REMAIN.        NUNU 110
C-----                                                                  NUNU 120
C                                                                       NUNU 130
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             NUNU 140
C-----                                                                  NUNU 150
C.....IF KEEP .NE.1492, THE RECORD JUST READ IS IGNORED                 NUNU 160
C                                                                       NUNU 170
      KEEP=1492                                                         NUNU 180
      IF(NSUB.EQ.145)KEEP=1
      IF(NSUB.EQ.16)X(2)=0
      IF(NSUB.EQ.120)X(1)=0
      IF(NSUB.EQ.82)X(4)=0.
      X(7)=X(4)-X(5)
      IF(X(4).EQ.0..OR.X(5).EQ.0.)X(7)=0.
      IF(X(4).EQ.0..OR.X(2).EQ.0.)X(8)=0.
      IF(X(4).EQ.0..OR.X(2).EQ.0.)RETURN
      X(8)=X(4)/X(2)**(1./3)
      RETURN                                                            NUNU 190
      END                                                               NUNU 200
```

b.

Figure 21. Editing with NUNU99.

- deleting subject number 145 from the sample,
- setting weight for subject 16 equal to zero,
- setting age for subject 120 equal to zero,
- setting stature for subject 82 equal to zero.

In this manner, we have edited out subject 145, who appears to be substantially smaller than anyone else, and also edited out three individual values that seem to be undoubtedly in error. The result is shown in Figure 22.

STATISTICS FOR VARIABLES 1 THROUGH 8

	1 AGE		2 WEIGHT		3 GRIP STRENGTH		4 STATURE		5 CERVICAL HEIGHT		6 ACROMION HEIGHT		7 STATURE-CERVICALE		8 HEIGHT/WEIGHT**1/3	
	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT	VALUE	SBJCT
1ST SMALLEST	305.0	95	140.0	128	41.0	154	1643.0	173	1392.0	173	1329.0	60	221.0	77	289.3	106
2ND SMALLEST	315.0	112	142.0	59	42.0	177	1644.0	35	1400.0	60	1329.0	35	223.0	84	291.3	122
3RD SMALLEST	315.0	82	145.0	139	42.0	135	1646.0	93	1401.0	35	1335.0	95	230.0	64	292.4	69
4TH SMALLEST	325.0	100	147.0	95	42.0	92	1650.0	60	1405.0	95	1337.0	173	231.0	169	293.3	60
5TH SMALLEST	325.0	89	148.0	177	43.0	126	1651.0	95	1407.0	93	1349.0	36	232.0	86	293.5	98
6TH SMALLEST	325.0	87	148.0	151	44.0	165	1657.0	36	1414.0	36	1351.0	93	233.0	177	294.4	79
7TH SMALLEST	325.0	86	149.0	72	44.0	80	1672.0	103	1417.0	165	1356.0	103	233.0	164	295.9	40
8TH SMALLEST	335.0	111	149.0	29	44.0	67	1676.0	80	1417.0	80	1356.0	80	233.0	117	296.3	150
9TH SMALLEST	335.0	88	150.0	93	45.0	94	1679.0	169	1420.0	103	1363.0	119	233.0	107	296.6	86
XTH SMALLEST	335.0	83	150.0	35	45.0	93	1685.0	153	1435.0	119	1374.0	153	233.0	15	297.9	169
******																
XTH LARGEST	445.0	18	213.0	69	66.0	43	1875.0	108	1619.0	133	1544.0	43	283.0	42	330.4	139
9TH LARGEST	445.0	24	213.0	163	67.0	38	1881.0	120	1621.0	120	1545.0	172	284.0	91	330.5	130
8TH LARGEST	445.0	33	216.0	44	67.0	104	1882.0	44	1622.0	108	1547.0	109	285.0	75	331.5	70
7TH LARGEST	445.0	35	216.0	112	68.0	109	1886.0	83	1623.0	157	1551.0	89	285.0	149	331.7	19
6TH LARGEST	445.0	38	221.0	144	68.0	112	1892.0	157	1624.0	83	1553.0	108	286.0	165	331.8	111
5TH LARGEST	445.0	44	225.0	122	68.0	122	1899.0	43	1630.0	140	1566.0	140	287.0	20	332.6	157
4TH LARGEST	445.0	59	231.0	155	70.0	57	1906.0	140	1631.0	44	1579.0	44	292.0	33	335.0	72
3RD LARGEST	445.0	67	237.0	83	70.0	81	1913.0	102	1669.0	20	1585.0	102	294.0	43	335.7	38
2ND LARGEST	445.0	123	239.0	31	71.0	98	1923.0	31	1675.0	31	1607.0	20	296.0	176	338.8	102
1ST LARGEST	445.0	126	242.0	98	73.0	106	1956.0	20	1675.0	102	1607.0	31	299.0	142	351.9	128
THE MEAN VALUE	401.40		180.61		55.16		1773.03		1517.69		1452.39		255.92		314.12	
STD. DEVIATION	39.10		20.29		6.72		63.95		59.37		57.79		15.15		10.73	
COFF/VARIATION	9.74		11.23		12.19		3.61		3.91		3.98		5.92		3.42	
''TOP''	.27		.16		.19		.22		.24		.26		.24		.27	
''BOT''	0.00		.46		.33		.43		.31		.37		.32		.66	
VETA ONE	-.71		.53		.23		.31		.37		.27		.42		.23	
VETA TWO	2.16		3.30		2.65		2.69		2.85		2.81		3.10		3.26	
(N-20)-AVG EST	404.31		179.74		55.02		1771.79		1516.56		1451.49		255.33		314.06	
(N-20)-S.D.EST	45.64		19.93		6.87		65.84		60.08		58.75		14.96		10.76	
PCT DIFF/MEANS	-6.		4.		2.		2.		2.		2.		4.		1.	
PCT DIF/ST DVS	-14.		2.		-2.		-3.		-1.		-2.		1.		-0.	
SIZE OF SAMPLE	136		145		145		146		147		147		146		144	

1/20/78 ** --- XVAL TEST --- ** PAGE 2

Figure 22. An example of edited statistics.

THE EDITING PROGRAM*

The EDIT program is designed to single out from a mass of normally distributed data those values which appear to be abnormal or aberrant when judged in terms of other data for the same subject. The program's procedure is based on the computation of multiple regression equations for estimating a given variable in terms of a pair of related variables, followed by a comparison of the "actual" values with their regression estimates. When the differences between these values exceed a preassigned criterion (expressed in terms of the regression equation's standard error of estimate), the program reports this fact, together with a variety of relevant information. A decision can then be made as to how the aberrant value should be treated. The EDIT program consists of the main computer program, a series of subroutines and a series of control cards which relate to the input data and how it will be used in the program. An EDIT computer deck setup is illustrated in Figure 23.

THE PROGRAM INPUT

In using the program, one supplies the computer with five sets of information: the combinations of variables; the lists of variables to be used for comparison; the criteria of aberrance; the number of iterations; and the number of subjects for equation computation.

The Combinations of Variables

Variables, in sets of three, are usually selected so that the multiple correlation for each one of the three in terms of the other two is fairly high. Examples of useful combinations include:

- *Stature, shoulder height, chest height.* These variables have the double virtue of being of the same anatomical type (heights) and of being overlapping measurements.
- *Waist depth, waist breadth, waist circumference.* The combination of breadth, depth, and circumference is tied fairly closely together by geometric restraints. These three variables may not be highly correlated individually, but the multiple correlations should be high.
- *Biceps circumference, elbow circumference, forearm circumference*--three measurements of the same type made on the same part of the body.
- *Hand length, foot length, stature*--three "long-bone" measurements.

---

* A complete printout of the EDIT program is included as Appendix B.

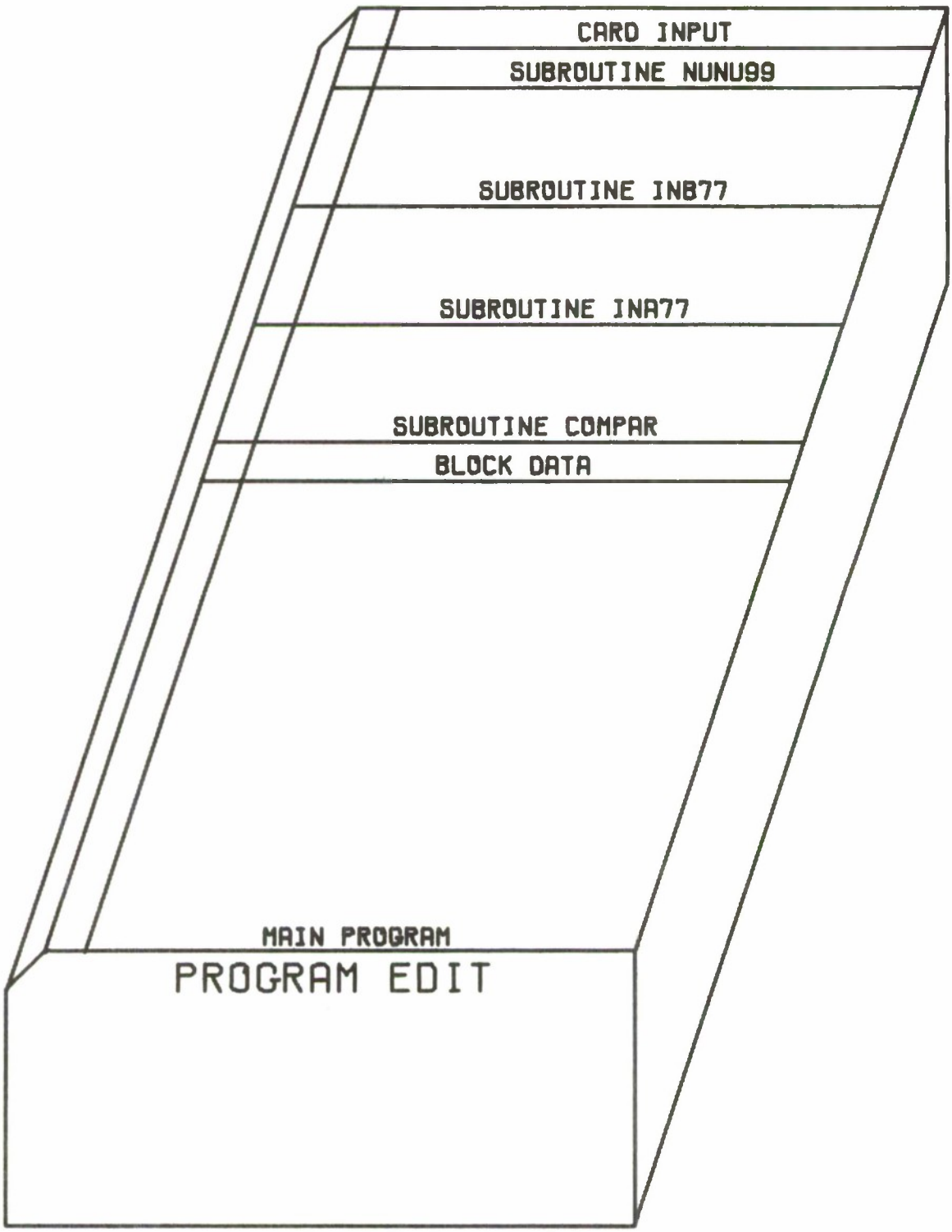


Figure 23. EDIT deck setup.

For each combination, the program computes three equations and the related standard errors of estimate for estimating each variable in terms of the other two. The order in which the three variables are specified has no significance. Up to 125 variables, in a maximum of 100 combinations, may be used in the editing program. A given variable may be used in any number of combinations.

It is often desirable to create variables to use in the editing program from read-in variables. We might, for example, create the variable, stature/$\sqrt[3]{\text{weight}}$, from the read-in variables of stature and weight. To do this, it is only necessary to write the appropriate FORTRAN statement, insert this in subroutine NUNU99 and change the value of the statement for NVC on the $ED NAMELIST card to the number of computed variables. These computed variables will appear on the printout in continuing numerical sequence following the read-in variables.

If it is desirable to compare a variable with only one rather than two other variables, this can be done by specifying a constant as the third variable in the combination (see "Combination Cards" for EDIT program, page 64). A constant can be created by putting a FORTRAN statement in subroutine NUNU99.

The Lists

When a value is flagged as being apparently aberrant, it is often desirable to compare this value with a variety of other data. Thus, if the stature-shoulder height-chest height combination indicates that one of these heights is out of line with the other two, it might be important to examine all other height data for the subject in question. If the waist breadth-depth-circumference combination signalled a possibly discrepant value, one might wish to check on the subject's weight and his other torso breadths, depths, and circumferences.

The purpose of the lists is to specify the additional variables with which out-of-line values from a given combination can be compared. Numbered lists containing as many as 18 variables are read into the computer; each combination should have associated with it the number of one of these lists. There may be as many as 20 different lists. A variable can, of course, appear in more than one list, and a list can be associated with any number of combinations.

The Criterion of Aberrance

A datum is treated as possibly aberrant if the difference between the regression equation estimate and the recorded value exceeds a specified number of standard errors of estimate. The choice of this number (CK) is arbitrary and depends somewhat on the sample size, the number of variables and combinations, the state of the data and so forth. If no criterion value is specified, the computer supplies a default value of 3.5. The person

using the program for the first time may do well to use this value initially, subsequently raising or lowering it as seems desirable.

With very small samples, the selection of the criterion must take into account the fact that no difference between "actual" and regression values can ever exceed $\sqrt{N-1}$ standard deviations (N=number of subjects). With the criterion set at 4.0, there can be no "aberrant" values if $N \leq 17$.

Number of Iterations

The program reads in a specified number of data records, accumulating the values, squares, and cross products necessary to determine the regression equations, and storing the data as it proceeds. Once the regression equations have been computed, the data are reentered into the system, and the comparisons of estimated values with actual values are made. Whenever an out-of-line value is sensed for an individual, the data for the comparison which flagged the out-of-line value are removed from the summations. After all the comparisons have been made, the equations are recomputed, and the process of making the comparisons is repeated.

The reason for recomputing the equations and remaking the comparisons is that if the data contain even a few highly erroneous values, the regression equations based on these values will be erroneous and the standard errors of estimate will, as a rule, be quite high. Ordinarily, highly erroneous values will be caught on the first round of comparisons. By removing them from the summations, one gets more realistic and reliable equations and smaller, but still significant, discrepancies can be caught.

The computer will set the number of iterations at two unless otherwise instructed. Usually this will be satisfactory. If the data are quite "dirty," three iterations may be desirable. When the data on which the equations are being computed have already been edited, a single iteration may suffice.

Number of Subjects Used in Computing the Regression Equations

Unless contrary instructions are provided, the program will base the regression equations on the data for all the subjects. With large numbers of subjects, it may be practical and conserving of computer time to base the equations on some fraction of the sample, say the first 500 subjects. Similarly, when editing a set of data consisting of already edited records followed by a number of unedited records, the most satisfactory procedure is often to base the equation on the clean or previously edited data and set the number of iterations to unity.

To change the program to use only a limited set of subjects, set the value of NEQ on the $ED NAMELIST to the appropriate number of subjects. When this option is exercised, the program goes through the specified number of iterations for these first

NEQ=( ) subjects, and then proceeds to read in and check the data for all the remaining subjects.

Number of Subjects in Data Set

As the program is presently written, the maximum number of subjects cannot exceed 9998. On the rare occasions when the subjects exceed this number, the program can be modified by changing the value for NTOTAL (total number of subjects, plus one) on the $ED NAMELIST to the appropriate value. If, for example, we wanted to modify the program to accept a sample size of 10,001, the value of NTOTAL would be changed to at least 10,002, a value larger than the size of the sample.

Size of Input Data

The number of digits for any datum value will have little effect on the calculations but at several points the printouts are fairly compact. Therefore, data input values should be expressed with no more than four places to the left and one to the right of the decimal point. (The program was written so that a 120-character printer would print its output. When the program is used in conjunction with a 132-character printer, the F6.1's in several of the output format statements could easily be changed to F7.1's or F7.2's.) When the values are either too big or too small, they can be adjusted either by a suitable format statement or by addition of the NUNU99 subroutine to the basic input program.

Major Programming Changes

The total number of variables that can be used is presently set at 125, but it could be much larger on many of the larger late-model computers. To increase this limit, it is necessary to replace 125 with the desired variable number value in the dimensional statements for X, NAME and A in COMMON/DATUM in the main program and in each subroutine. It should be pointed out, however, that increasing the number of variables uses computer memory and the upper limit for such variables is, therefore, finite.

The number of combinations can be increased beyond its present 100 by replacing this value with the appropriate number in the COMMON/COMP statements for JOB, S, SS and CSQ. The value of MAXCOM must also be changed to match the new combinations value.

To increase the number of lists, change the dimension in COMMON/COMP for LIST from the present 20 to the appropriate value and the IF statement in line 62 of the program to the same value.

THE PREPARATION OF PROGRAM INPUT CARDS

The namelist, the first card of data, resets the values of a number of control variables. The initial values for all the namelist variables are written into the program. If no changes in these values are needed, a blank namelist is used ($ED $). If, however, changes are required to handle a specific set of data, the following options can be executed by specifying the appropriate values in the NAMELIST card:

CK - the test value in number of units of standard errors of estimate away from the regression value that will flag a datum for inspection. The value is set at 3.5 units unless changed.

NREP - the number of iterations the program goes through. (Set at two in the program unless changed.)

NEQ - the number of subjects used on which to base the regression equations. NEQ is set equal to the total sample unless a value is specified in the namelist.

NTOTAL - a number larger than the total number of subjects. (Initially set to 9999 in the program.)

NPUNCH - if NPUNCH is not equal to zero, the variable number, variable name, the mean, and the standard deviation for each variable are punched out. (Initially set to zero in the program.)

NPRINT - if NPRINT is one or more, infomation on iterations other than the last is printed out and a listing of the combinations together with the single and multiple correlations are printed out. (Initially set to zero in the program.)

NCV - the number of computed variables. (Initially set to zero in the program.)

Let us assume that it is necessary to edit a new data set for 10,000 subjects. As this is the first run on these data, we anticipate that there will be a number of aberrant values to scan. We want to set the test value at 5 rather than 3.5 and the number of repetitions at three. We want the mean and standard deviation for each variable to be punched and each iteration to be listed. For editing purposes, we wish to base the equations on only the first 500 records and to create 12 new variables from the data being read in. The NAMELIST card is, therefore, modified as shown in Figure 24a. Only a single modification was made on the NAMELIST card used in the sample program which will be described later (see Figure 24b).

```
$ED CK=5, NREP=3, NEQ=500, NTOTAL=10001, NPUNCH=1, NPRINT=1, NCV=12$

000000000 0000000 000000   00 0 0000   0 000 00000 000000 00 000 0000000000000000
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
11111111111111111111111111111111 11 111 11111111 11111111 111111 1111111111111
.....  ..........................................................  ..........
```

Figure 24a. Modified NAMELIST input card.

```
$ED  NPRINT = 9  $

00000000000 0000000000000000000000000000000000000000000000000000000000000000000000
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
11111111111111111111111111111111111111111111111111111111111111111111111111111111
................................................................................
```

Figure 24b. Slightly modified NAMELIST input card.

Combination Cards

The combination card, illustrated in Figure 25, is divided into six fields: columns 5-16, 17-28, 29-40, 41-52, 53-64, 65-76. Each field contains the information for one combination in the following pattern:

5th-7th columns: number of 1st variable
8th-10th columns: number of 2nd variable
11th-13th columns: number of 3rd variable
14th-16th columns: number of associated list

The first four columns (COMB) are used to identify the card as a combination card.

```
COMB  2  3  4  1  3  4  5  1  6  7  8  1  9 10 11  1  2 12 13  1  1  7  8  1

0000000000000000000000000000000000000000000000000 0000000000000000000000000000000000
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
1111111111111111 1111111111 1111111111 1111 11  11 1111 11 111 11 11111111 1111
```

Figure 25. COMBination card.

There is no particular significance to the order in which the three variables that make up a combination are listed, nor, with one exception, is there any significance to the order of

the combinations. An individual card can contain anywhere from one to six combinations, using any of the six fields on the card.

The one instance where the order in which the combinations are read into the computer makes a difference is related to the table for the standard-score values which precedes the list of errors. This table is based, for each variable, on the mean and standard deviation as calculated in connection with the last combination in which that variable appeared. If a variable is missing from a substantial number of data records, it may be well to put combinations involving this variable near the beginning as the standard-score values for variables grouped with a missing variable will also be based on the reduced sample.

The maximum number of combinations is set at 100 by the program.

List Cards

The list cards take the form shown in Figure 26:

columns 1-4 - LIST
columns 5-7 - number of the list
columns 8-10 - number of first variable on list
columns 11-13 - number of second variable on list, and so on.

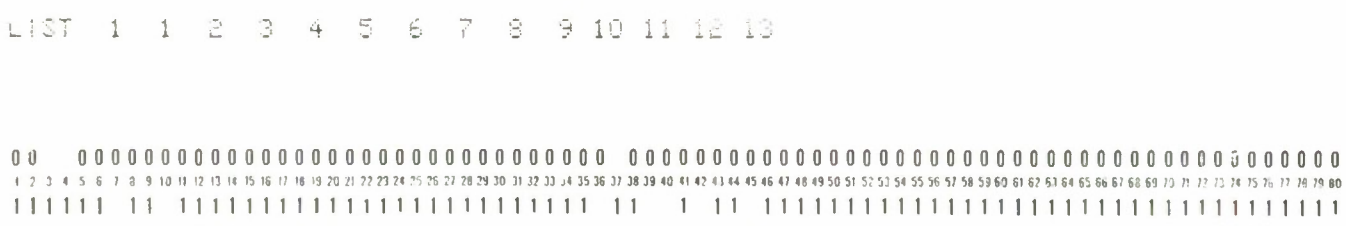


Figure 26. LIST card.

There may be anywhere from 1 to 18 variables on a list; there may be blanks in the arrangement on the cards. List numbers need not be consecutive although the highest permissible number is 20.

The list and combination cards are placed after the $ED $ NAMELIST and are followed by a blank card (see Figure 27). The program checks the first four columns for COMB, LIST or blank; if anything else is found, the program prints "something is wrong with this combo-list card." After the program finds a blank card, the next card must be a $CNTRL NAMELIST.

Data Input

The data input for the EDITing program is identical to that previously described for the XVAL program (see sections on INA77, INB77 and NUNU99). A typical card setup begins with a namelist CNTRL card on which we enter the number of variables.

The next card contains a heading to identify the subject group, in this case "USAF 1967 first 150 subjects." The next card is the format for the data to be punched on the card, in this case "(I4, 13F5.0)." Following this is a group of cards each containing the name and number of individual variables. This group is followed by cards listing the individual subject data in the specified format.

The input setup described above is shown in Figure 27. This setup is for the CDC 6600 and will be somewhat different for other computers.

USING THE EDIT PRINTOUT

To illustrate the use of the program output for editing anthropometric data, a sample printout has been prepared and is shown in Figures 28-31.

The first component (Figure 28) shows: (1) the NAMELIST $ED values; (2) the program parameters including the combinations and the lists; (3) values for NAMELIST $CNTRL; (4) identification of the subject group and listing of the format for the name cards and the data cards; (5) list of name cards; and (6) data from the first 10 and every 100th subject.

Following verification of the input as described above and shown in Figure 28, the editing begins. The summary statistics for the variables by editing combinations for the first data run are listed (Figure 29). These include, for each variable, the mean, standard deviation, the multiple correlation of the variable with the other two variables in the combinations as well as the regression equations, the simple correlations and the sample size (N).

Figure 30 shows a listing of subjects that were flagged as having aberrant values based on the value of CK. Each entry in the list consists of the subject number followed by the variable number and name, the recorded value, the regression value, and the number of units of standard error of estimate the values differ for each of the three variables in the combination.

The summary statistics are again given as computed after the aberrant values flagged in the initial run have been deleted (Figure 31). Note that the multiple correlation coefficients have been improved with the removal of the aberrant values.

With the printout in hand the NAMELIST values given at the head of the printout are checked to assure that the intended input parameters were indeed used. The combinations and lists are also scanned in order to determine that each of the variables of interest are included in at least one combination and in the list called for by that particular combination (Figure 28, (2)). The summary statistics and list of aberrant values can initially be ignored. The second set of summary statistics is scanned

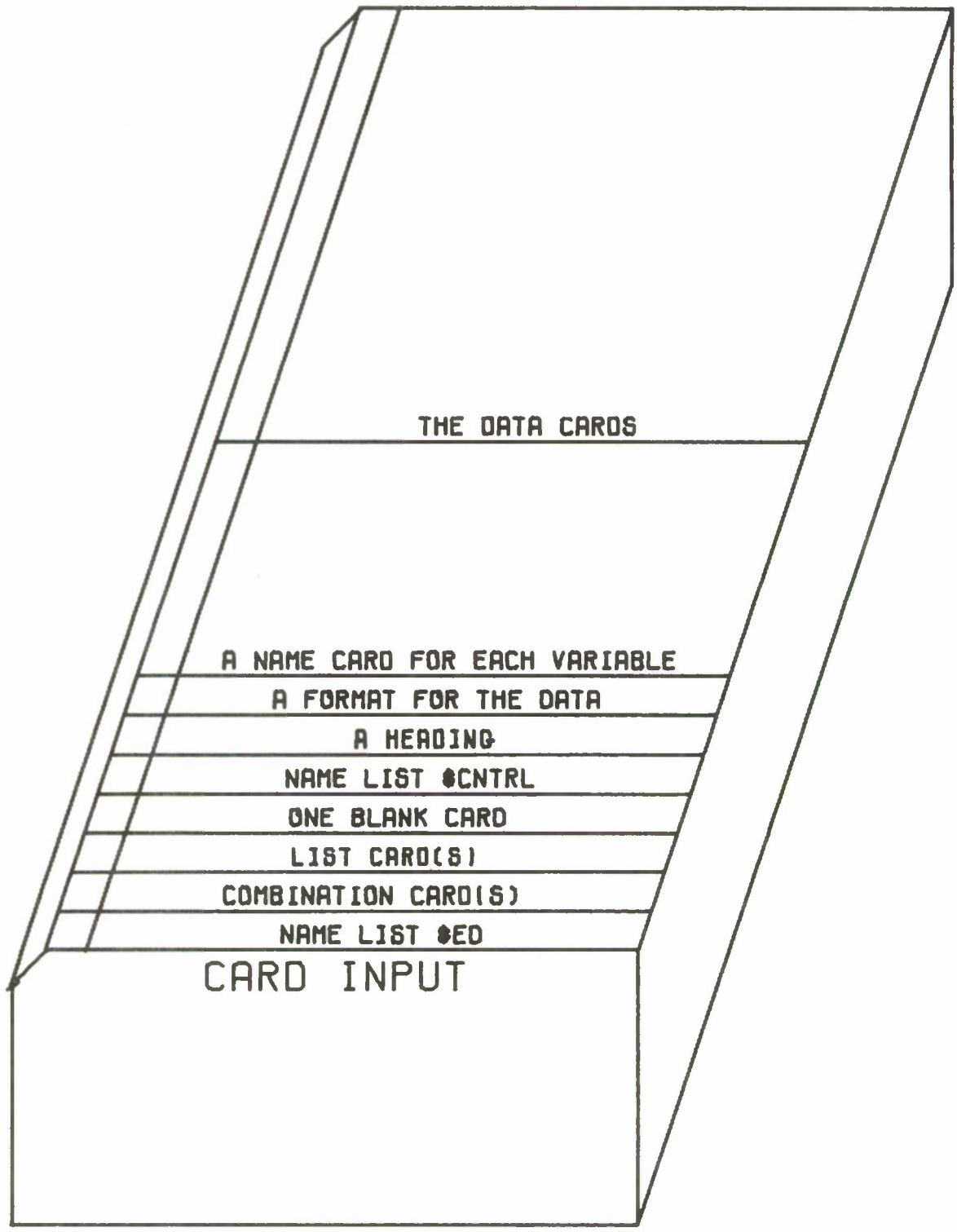


Figure 27. Typical card setup.

```
$ED

CK       = .35E+01,
NREP     = 2,
NEQ      = 9999,
NTOTAL   = 9999,
NPUNCH   = 0,
NPRINT   = 9,
NCV      = 0,

$END
```

(1)

```
THE PROGRAM PARAMETERS----
NEQ, THE NUMBER OF RECORDS IN THE EQUATIONS = 9999
NTOTAL, THE TOTAL NUMBER OF RECORDS =         9999
NREP, THE NUMBER OF REPETITIONS =                2
CK, THE CHECK VALUE =                         3.50
NCOM, THE NUMBER OF COMBINATIONS =               6
NLISTS, THE NUMBER OF LISTS =                    1
```

(2)

```
THE COMBINATIONS----
    1.   2-   3-    4 (   1)     2.   3-   4-   5 (   1)     3.   6-   7-   8 (   1)     4.   9-  10-  11 (   1)
    5.   2-  12-   13 (   1)     6.   1-   7-   8 (   1)

THE LISTS---
  1       1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, -0, -0, -0, -0,-00
```

```
$CNTRL

NV       = 13,
NW       = 13,
NS       = 77777,
NT       = 5,
K6       = 100,
LN       = 13,
LB       = 1,
LT       = 0,
N1       = 0,
N2       = 1,
NER      = 0,
IER      = 0,
IWHEN    = 0,
IRR      = 77777,
NHDG     = 0,

$END
```

(3)

Figure 28. Input verification.

```
          USAF 1967 FIRST 150 SUBJECTS
(4)  (I4,2X,4A4,A2,3F8.2,2F6.2,2F10.7)
     (I4,13F5.0)
       1  HEIGHT                  -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       2  STATURE                 -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       3  SHOULDER HEIGHT         -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       4  CHEST HEIGHT            -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       5  WAIST HEIGHT            -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
(5)    6  WAIST DEPTH             -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       7  WAIST BREADTH           -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       8  WAIST CIRC              -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
       9  BICEPS CIRC             -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
      10  ELBOW CIRC              -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
      11  FOREARM CIRC            -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
      12  HAND LENGTH             -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
      13  FOOT LENGTH             -0.0      -0.0      -0.0      -0.00      -0.00  -0.00000  -0.00000
 NREC =     1  NSUB =    15
  179. 1711. 1478. 1260. 1024.  269.  337.  995.  286.  261.  266.  188.  260.
 NREC =     2  NSUB =    16
  170. 1766. 1514. 1261. 1045.  225.  301.  841.  326.  275.  282.  193.  249.
 NREC =     3  NSUB =    17
  172. 1834. 1566. 1324. 1102.  204.  293.  805.  297.  269.  272.  187.  268.
 NREC =     4  NSUB =    18
  183. 1779. 1536. 1281. 1075.  247.  361.  953.  326.  272.  278.  186.  272.
 NREC =     5  NSUB =    19
(6)
  210. 1860. 1603. 1395. 1142.  256.  357. 1020.  330.  298.  307.  200.  288.
 NREC =     6  NSUB =    20
  210. 1956. 1669. 1425. 1164.  211.  309.  845.  344.  300.  306.  210.  297.
 NREC =     7  NSUB =    21
  153. 1774. 1512. 1279. 1051.  198.  277.  777.  301.  270.  276.  186.  268.
 NREC =     8  NSUB =    22
  165. 1734. 1499. 1279. 1073.  225.  289.  825.  324.  283.  285.  191.  273.
 NREC =     9  NSUB =    24
  187. 1851. 1593. 1341. 1132.  219.  328.  899.  312.  283.  278.  208.  287.
 NREC =    10  NSUB =    25
  184. 1806. 1551. 1278. 1065.  251.  342.  946.  318.  285.  290.  197.  280.
 NREC =   100  NSUB =   128
  140. 1827. 1575. 1335. 1120.  214.  320.  858.  270.  261.  271.  199.  287.
***DATA INPUT COMPLETED WITH READING OF RECORD FOR SUBJECT NO.  178. THIS WAS THE  150TH RECORD USED, THE  150TH RECORD READ
```

Figure 28 (cont'd). Input verification.

```
SUMMARY STATISTICS FOR COMBINATION NO.   1                    (  2,  3,  4)

X = STATURE                    Y = SHOULDER HEIGHT              Z = CHEST HEIGHT
 THE MEAN VALUE =   1774.44      THE MEAN VALUE =   1516.74       THE MEAN VALUE =   1288.87
 ST'O OEVIATION =     66.47      ST'O DEVIATION =     60.55       ST'O OEVIATION =     54.72
 X = (      .695)Y, + (      .372)Z +    240.673   SE =   24.542 MULTIPLE CORR. COEF. = .929
 Y = (      .312)X, + (      .709)Z +     49.536   SE =   16.442 MULTIPLE CORR. COEF. = .962
 Z = (      .164)X, + (      .694)Y +    -54.023   SE =   16.270 MULTIPLE CORR. COEF. = .955

          SIMPLE CORRELATIONS-R(XY) =  .925, R(XZ) =  .909, R(YZ) =  .952          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   2                    (  3,  4,  5)

X = SHOULDER HEIGHT            Y = CHEST HEIGHT                 Z = WAIST HEIGHT
 THE MEAN VALUE =   1516.74      THE MEAN VALUE =   1288.87       THE MEAN VALUE =   1066.39
 ST'O OEVIATION =     60.55      ST'O DEVIATION =     54.72       ST'O OEVIATION =     49.45
 X = (      .605)Y, + (      .531)Z +    170.542   SE =   16.022 MULTIPLE CORR. COEF. = .964
 Y = (      .585)X, + (      .357)Z +     21.277   SE =   15.751 MULTIPLE CORR. COEF. = .958
 Z = (      .483)X, + (      .336)Y +    -98.122   SE =   15.273 MULTIPLE CORR. COEF. = .951

          SIMPLE CORRELATIONS-R(XY) =  .952, R(XZ) =  .944, R(YZ) =  .934          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   3                    (  6,  7,  8)

X = WAIST OEPTH                Y = WAIST BREAOTH                Z = WAIST CIRC
 THE MEAN VALUE =    235.41      THE MEAN VALUE =    322.05       THE MEAN VALUE =    907.49
 ST'O DEVIATION =     20.42      ST'O DEVIATION =     21.76       ST'O OEVIATION =     63.96
 X = (     -.203)Y, + (      .341)Z +     -9.151   SE =    9.577 MULTIPLE CORR. COEF. = .883
 Y = (     -.211)X, + (      .361)Z +     43.813   SE =    9.772 MULTIPLE CORR. COEF. = .893
 Z = (     1.531)X, + (     1.557)Y +     45.700   SE =   20.282 MULTIPLE CORR. COEF. = .948

          SIMPLE CORRELATIONS-R(XY) =  .734, R(XZ) =  .878, R(YZ) =  .888          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   4                    (  9, 10, 11)

X = BICEPS CIRC                Y = ELBOW CIRC                   Z = FOREARM CIRC
 THE MEAN VALUE =    316.43      THE MEAN VALUE =    278.25       THE MEAN VALUE =    282.89
 ST'O OEVIATION =     22.70      ST'O DEVIATION =     13.27       ST'O OEVIATION =     14.80
 X = (     1.063)Y, + (      .291)Z +    -61.533   SE =   14.266 MULTIPLE CORR. COEF. = .778
 Y = (      .264)X, + (      .423)Z +     75.015   SE =    7.112 MULTIPLE CORR. COEF. = .844
 Z = (      .121)X, + (      .706)Y +     48.277   SE =    9.189 MULTIPLE CORR. COEF. = .784

          SIMPLE CORRELATIONS-R(XY) =  .768, R(XZ) =  .671, R(YZ) =  .775          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   5                    (  2, 12, 13)

X = STATURE                    Y = HAND LENGTH                  Z = FOOT LENGTH
 THE MEAN VALUE =   1774.44      THE MEAN VALUE =    193.18       THE MEAN VALUE =    272.21
 ST'O OEVIATION =     66.47      ST'O DEVIATION =      8.85       ST'O OEVIATION =     11.32
 X = (     3.064)Y, + (     2.279)Z +    562.070   SE =   43.950 MULTIPLE CORR. COEF. = .750
 Y = (      .043)X, + (      .428)Z +      .180   SE =    5.210 MULTIPLE CORR. COEF. = .809
 Z = (      .053)X, + (      .709)Y +     41.163   SE =    6.703 MULTIPLE CORR. COEF. = .806

          SIMPLE CORRELATIONS-R(XY) =  .709, R(XZ) =  .705, R(YZ) =  .775          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   6                    (  1,  7,  8)

X = WEIGHT                     Y = WAIST BREADTH                Z = WAIST CIRC
 THE MEAN VALUE =    179.79      THE MEAN VALUE =    322.05       THE MEAN VALUE =    907.49
 ST'O OEVIATION =     20.70      ST'O DEVIATION =     21.76       ST'O DEVIATION =     63.96
 X = (      .471)Y, + (      .069)Z +    -34.620   SE =   14.950 MULTIPLE CORR. COEF. = .692
 Y = (      .191)X, + (      .262)Z +     50.105   SE =    9.528 MULTIPLE CORR. COEF. = .899
 Z = (      .262)X, + (     2.441)Y +     74.275   SE =   29.092 MULTIPLE CORR. COEF. = .891

          SIMPLE CORRELATIONS-R(XY) =  .685, R(XZ) =  .653, R(YZ) =  .888          N =  150.
```

Figure 29. Summary statistics for the first iteration.

```
COMPAR CALLED WITH NREP =     2 * NTEST =,   150

SUBJECT   113
NO.  2 STATURE          1961. 1715.  10.0 **   3 SHOULDER HEIGHT   1454. 1545.  -5.6 **   4 CHEST HEIGHT      1247. 1276.  -1.8
NO.  2 STATURE          1961. 1774.   4.3 **  12 HAND LENGTH        191.  202.  -2.2 **  13 FOOT LENGTH       275.  281.   -.8

SUBJECT   122
NO.  1 WEIGHT            125.  229.  -7.0 **   7 WAIST BREADTH     395.  368.   2.8 **   8 WAIST CIRC        1124. 1071.   1.8

SUBJECT   150
NO.  9 BICEPS CIRC       342.  321.   1.5 **  10 ELBOW CIRC        303.  253.   7.0 **  11 FOREARM CIRC      208.  303. -10.4

COMPAR FINISHED. CONTROL RETURNED TO MAIN PROGRAM
```


Figure 30. List of subjects with aberrant values, first iteration.

```
SUMMARY STATISTICS FOR COMBINATION NO.   1                    (  2,  3,  4)

X = STATURE                    Y = SHOULDER HEIGHT              Z = CHEST HEIGHT
 THE MEAN VALUE =   1773.19      THE MEAN VALUE =   1517.16       THE MEAN VALUE =   1289.15
 ST'D DEVIATION =     64.91      ST'D DEVIATION =     60.53       ST'D DEVIATION =     54.79
 X = (      .785)Y, + (      .301)Z +    194.619   SE =   13.925 MULTIPLE CORR. COEF. = .977
 Y = (      .666)X, + (      .301)Z +    -52.604   SE =   12.829 MULTIPLE CORR. COEF. = .977
 Z = (      .387)X, + (      .457)Y +    -91.109   SE =   15.807 MULTIPLE CORR. COEF. = .957

         SIMPLE CORRELATIONS-R(XY) =  .974, R(XZ) =  .951, R(YZ) =  .952          N =  149.
SUMMARY STATISTICS FOR COMBINATION NO.   2                    (  3,  4,  5)

X = SHOULDER HEIGHT            Y = CHEST HEIGHT                 Z = WAIST HEIGHT
 THE MEAN VALUE =   1516.74      THE MEAN VALUE =   1288.87       THE MEAN VALUE =   1066.39
 ST'D DEVIATION =     60.55      ST'D DEVIATION =     54.72       ST'D DEVIATION =     49.45
 X = (      .605)Y, + (      .531)Z +    170.542   SE =   16.022 MULTIPLE CORR. COEF. = .964
 Y = (      .585)X, + (      .357)Z +     21.277   SE =   15.751 MULTIPLE CORR. COEF. = .958
 Z = (      .483)X, + (      .336)Y +    -98.122   SE =   15.273 MULTIPLE CORR. COEF. = .951

         SIMPLE CORRELATIONS-R(XY) =  .952, R(XZ) =  .944, R(YZ) =  .934          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   3                    (  6,  7,  8)

X = WAIST DEPTH                Y = WAIST BREADTH                Z = WAIST CIRC
 THE MEAN VALUE =    235.41      THE MEAN VALUE =    322.05       THE MEAN VALUE =    907.49
 ST'D DEVIATION =     20.42      ST'D DEVIATION =     21.76       ST'D DEVIATION =     63.96
 X = (     -.203)Y, + (      .341)Z +     -9.151   SE =    9.577 MULTIPLE CORR. COEF. = .883
 Y = (     -.211)X, + (      .361)Z +     43.813   SE =    9.772 MULTIPLE CORR. COEF. = .893
 Z = (     1.531)X, + (     1.557)Y +     45.700   SE =   20.282 MULTIPLE CORR. COEF. = .948

         SIMPLE CORRELATIONS-R(XY) =  .734, R(XZ) =  .878, R(YZ) =  .888          N =  150.
SUMMARY STATISTICS FOR COMBINATION NO.   4                    (  9, 10, 11)

X = BICEPS CIRC                Y = ELBOW CIRC                   Z = FOREARM CIRC
 THE MEAN VALUE =    316.26      THE MEAN VALUE =    278.09       THE MEAN VALUE =    283.40
 ST'D DEVIATION =     22.67      ST'D DEVIATION =     13.16       ST'D DEVIATION =     13.52
 X = (      .482)Y, + (      .876)Z +    -66.050   SE =   13.915 MULTIPLE CORR. COEF. = .790
 Y = (      .055)X, + (      .835)Z +     23.991   SE =    4.701 MULTIPLE CORR. COEF. = .934
 Z = (      .099)X, + (      .827)Y +     22.184   SE =    4.677 MULTIPLE CORR. COEF. = .938

         SIMPLE CORRELATIONS-R(XY) =  .767, R(XZ) =  .783, R(YZ) =  .932          N =  149.
SUMMARY STATISTICS FOR COMBINATION NO.   5                    (  2, 12, 13)

X = STATURE                    Y = HAND LENGTH                  Z = FOOT LENGTH
 THE MEAN VALUE =   1773.19      THE MEAN VALUE =    193.19       THE MEAN VALUE =    272.19
 ST'D DEVIATION =     64.91      ST'D DEVIATION =      8.88       ST'D DEVIATION =     11.36
 X = (     3.220)Y, + (     2.157)Z +    563.900   SE =   41.325 MULTIPLE CORR. COEF. = .771
 Y = (      .050)X, + (      .403)Z +     -4.538   SE =    5.134 MULTIPLE CORR. COEF. = .816
 Z = (      .057)X, + (      .688)Y +     38.583   SE =    6.707 MULTIPLE CORR. COEF. = .807

         SIMPLE CORRELATIONS-R(XY) =  .734, R(XZ) =  .719, R(YZ) =  .776          N =  149.
SUMMARY STATISTICS FOR COMBINATION NO.   6                    (  1,  7,  8)

X = HEIGHT                     Y = WAIST BREADTH                Z = WAIST CIRC
 THE MEAN VALUE =    180.15      THE MEAN VALUE =    321.56       THE MEAN VALUE =    906.04
 ST'D DEVIATION =     20.28      ST'D DEVIATION =     20.99       ST'D DEVIATION =     61.66
 X = (      .528)Y, + (      .092)Z +    -73.095   SE =   12.056 MULTIPLE CORR. COEF. = .804
 Y = (      .305)X, + (      .223)Z +     64.530   SE =    9.161 MULTIPLE CORR. COEF. = .900
 Z = (      .521)X, + (     2.183)Y +    110.032   SE =   28.660 MULTIPLE CORR. COEF. = .885

         SIMPLE CORRELATIONS-R(XY) =  .793, R(XZ) =  .761, R(YZ) =  .879          N =  149.
```

Figure 31. Recomputed summary statistics.

with particular attention to the multiple correlation coefficients. The best possible predictive regression equations are for those combinations having a multiple correlation coefficient which approaches 1.00. With such a regression the estimated or predicted value will be essentially identical to the read-in value unless the latter is in error. Conversely, the poorest level of prediction is for those regression equations where the multiple correlation coefficient approaches 0.00. In such instances, the predicted value for a variable will be the group mean value and all values over CK units of standard deviation from the mean will be flagged as aberrant values.

In actual fact neither extreme of the multiple correlation coefficient normally occurs. Some anthropometric dimensions, such as long-bone measurements, have relatively high interrelationships (>.90) whereas measurements of the head and face have relatively low interrelationships (<.20). As the multiple correlation coefficient becomes smaller, the estimated value becomes closer to the mean of the read-in data and the range of acceptable read-in values expands with CK standard deviations as the limit. Conversely, as the multiple correlation coefficient becomes larger, the estimated value is less dependent on the mean of the read-in data and the range of acceptable read-in values contracts (see Table 1).

TABLE 1

RELATIONSHIP OF THE MULTIPLE CORRELATION COEFFICIENT AND ACCEPTABLE DEVIATIONS FROM THE ESTIMATE

R	Aberrant Value Must Exceed
0.00	± 3.5 SD
0.30	± 3.325
0.60	± 2.8
0.70	± 2.5
0.80	± 2.1
0.90	± 1.54
0.95	± 1.09
1.00	0.00

Where it is found that a variable is predicted poorly by the other two variables of a combination (that is, the "R" value is low), it may be necessary to try other combinations to attempt to improve the predictive level of the combination. Even when combinations are not ideal, however, it is possible to use them to edit the data. Poor judgment in the choice of combinations reduces the number of aberrant values called out but does not cause acceptable values to appear aberrant.

In editing data, the last two sections of the printout are of principal significance. The first of these (Figure 32) is

VARIABLE NO. 1 WEIGHT MEAN = 180.15 STD. DEV. = 20.28 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
79.	89. 99.	109. 119.	129. 140.	150. 160.	170. 180.	190. 200.	211. 221.	231. 241.	251. 261.	271. 282.

VARIABLE NO. 2 STATURE MEAN = 1773.19 STD. DEV. = 64.91 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
1449.	1481. 1514.	1546. 1578.	1611. 1643.	1676. 1708.	1741. 1773.	1806. 1838.	1871. 1903.	1935. 1968.	2000. 2033.	2065. 2098.

VARIABLE NO. 3 SHOULDER HEIGHT MEAN = 1516.74 STD. DEV. = 60.55 N= 150.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
1214.	1244. 1275.	1305. 1335.	1365. 1396.	1426. 1456.	1486. 1517.	1547. 1577.	1608. 1638.	1668. 1698.	1729. 1759.	1789. 1819.

VARIABLE NO. 4 CHEST HEIGHT MEAN = 1288.87 STD. DEV. = 54.72 N= 150.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
1015.	1043. 1070.	1097. 1125.	1152. 1179.	1207. 1234.	1262. 1289.	1316. 1344.	1371. 1398.	1426. 1453.	1480. 1508.	1535. 1562.

VARIABLE NO. 5 WAIST HEIGHT MEAN = 1066.39 STD. DEV. = 49.45 N= 150.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
819.	844. 869.	893. 918.	943. 967.	992. 1017.	1042. 1066.	1091. 1116.	1141. 1165.	1190. 1215.	1239. 1264.	1289. 1314.

VARIABLE NO. 6 WAIST DEPTH MEAN = 235.41 STD. DEV. = 20.42 N= 150.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
133.	144. 154.	164. 174.	184. 195.	205. 215.	225. 235.	246. 256.	266. 276.	286. 297.	307. 317.	327. 338.

VARIABLE NO. 7 WAIST BREADTH MEAN = 322.05 STD. DEV. = 21.76 N= 150.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
213.	224. 235.	246. 257.	268. 279.	289. 300.	311. 322.	333. 344.	355. 366.	376. 387.	398. 409.	420. 431.

VARIABLE NO. 8 WAIST CIRC MEAN = 907.49 STD. DEV. = 63.96 N= 150.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
588.	620. 652.	684. 716.	748. 780.	812. 844.	876. 907.	939. 971.	1003. 1035.	1067. 1099.	1131. 1163.	1195. 1227.

VARIABLE NO. 9 BICEPS CIRC MEAN = 316.26 STD. DEV. = 22.67 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
203.	214. 226.	237. 248.	260. 271.	282. 294.	305. 316.	328. 339.	350. 362.	373. 384.	396. 407.	418. 430.

VARIABLE NO. 10 ELBOW CIRC MEAN = 278.09 STD. DEV. = 13.16 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
212.	219. 225.	232. 239.	245. 252.	258. 265.	272. 278.	285. 291.	298. 304.	311. 318.	324. 331.	337. 344.

VARIABLE NO. 11 FOREARM CIRC MEAN = 283.40 STD. DEV. = 13.52 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
216.	223. 229.	236. 243.	250. 256.	263. 270.	277. 283.	290. 297.	304. 310.	317. 324.	331. 337.	344. 351.

VARIABLE NO. 12 HAND LENGTH MEAN = 193.19 STD. DEV. = 8.88 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
149.	153. 158.	162. 167.	171. 175.	180. 184.	189. 193.	198. 202.	207. 211.	215. 220.	224. 229.	233. 238.

VARIABLE NO. 13 FOOT LENGTH MEAN = 272.19 STD. DEV. = 11.36 N= 149.

-5 SD	-4.5 -4 SD	-3.5 -3 SD	-2.5 -2 SD	-1.5 - 1SD	-0.5 MEAN	+0.5 +1 SD	+1.5 +2 SD	+2.5 +3 SD	+3.5 +4 SD	+4.5 +5 SD
215.	221. 227.	232. 238.	244. 249.	255. 261.	267. 272.	278. 284.	289. 295.	301. 306.	312. 318.	323. 329.

Figure 32. Table of standard deviation values.

the table of values for deviations from the mean for each variable by half units of standard deviation. These values range from -5 standard deviations to +5 standard deviations, an extremely broad interval for most anthropometric dimensions. The second part of the editing output is the tabulation of the aberrant or suspect values by subject (Figure 33). The first line of Figure 33 contains the subject number followed on succeeding lines by the combinations. Each line contains a separate combination with variable number and name, the read-in and regression values as well as the number of units of standard error of estimate these deviate from one another for each of the three variables. There is such a line printed out for each subject for every combination in which the estimated value of a variable exceeds the read-in value by more than the specified CK units of standard error of estimate. Following on the next line are printed out the variable names called for in the list associated with each combination. Below each variable name is the read-in value for that variable and the number of units of standard deviation it lies above or below the variable mean value. On the line below this, under each list variable, the value of the aberrant or suspect value is estimated as though it deviated from its mean as many units of standard deviation as the list variable deviated from its mean value.

For example, as can be seen in Figure 33, subject 113 has been flagged as having a recorded stature of 1961 mm (approximately 6 Ft 3 in) whereas an estimated 1711 mm (approximately 5 ft 9 or 10 in) is predicted by the multiple regression equations based on measurements of his shoulder and chest heights. The difference between his recorded and estimated stature is the equivalent of 18 units of standard error of estimate. Scanning the predicted values of stature based on all the dimensions in the list, it is obvious that the recorded value is much too high. After studying the list one is led to suspect that a transposition of digits has occurred and that the recorded value of stature should, in all likelihood, be 1691 and not 1961. As a means of double-checking this assumption, we note that for this subject shoulder height and chest height (dimensions which correlate highly with stature) have recorded values which are approximately one standard deviation below their means. Turning back to Figure 32, note that a stature value equivalent to one standard deviation below the mean is equal to 1708 mm. Thus, our assumption of 1691 would appear to be a reasonable one. A similar process is continued for each of the aberrant values for each of the subjects tabulated in Figure 33.

Editing requires common sense and flexibility. One should always remember that aberrant values may be either errors or an abnormally sized or shaped individual. Errors are generated in three ways: a value misread in measuring, a misrecorded value, or a mispunched value. The methods of making the measurements and recording the data should be reviewed by the person who is going to do the editing. The editor should try to anticipate

```
COMPAR CALLED WITH NREP =     1 + NTEST =,    150

SUBJECT   113
NO.  2 STATURE            1961. 1711.  18.0 **   3 SHOULDER HEIGHT    1454. 1630. -13.7 **   4 CHEST HEIGHT       1247. 1333.  -5.4
NO.  2 STATURE            1961. 1772.   4.6 **  12 HAND LENGTH         191.  204.  -2.5 **  13 FOOT LENGTH         275.  281.   -.9
                1 WEIGHT     2 STATURE    3 SHOULDER    4 CHEST HE   5 WAIST HE   6 WAIST DE   7 WAIST BR   8 WAIST CI   9 BICEPS C
                                          HEIGHT        IGHT         IGHT         PTH          EADTH        RC           IRC
               163.0  -.85 1961.0  2.89 1454.0 -1.04 1247.0  -.77 1019.0  -.96  253.0   .86  321.0  -.05  925.0   .27  302.0  -.63
 STATURE          1718.27      1961.00      1705.93      1723.52      1710.99      1829.09      1770.05      1790.95      1732.36
 SHOULDER HEIGHT  1465.52      1691.94      1454.00      1470.41      1458.72      1568.89      1513.81      1533.31      1478.65
 CHEST HEIGHT     1242.58      1447.18      1232.17      1247.00      1236.44      1335.99      1286.22      1303.84      1254.45
               10 ELBOW CI  11 FOREARM   12 HAND LEN  13 FOOT LEN
                RC           CIRC         GTH          GTH
               257.0 -1.60  264.0 -1.43  191.0  -.25  275.0   .25
 STATURE          1669.17      1680.05      1757.15      1789.26
 SHOULDER HEIGHT  1419.71      1429.85      1501.78      1531.73
 CHEST HEIGHT     1201.19      1210.35      1275.35      1302.42

SUBJECT   122
NO.  1 WEIGHT             125.  239.  -9.5 **   7 WAIST BREADTH      395.  353.   4.5 **   8 WAIST CIRC         1124. 1038.   3.0
                1 WEIGHT     2 STATURE    3 SHOULDER    4 CHEST HE   5 WAIST HE   6 WAIST DE   7 WAIST BR   8 WAIST CI   9 BICEPS C
                                          HEIGHT        IGHT         IGHT         PTH          EADTH        RC           IRC
               125.0 -2.72 1772.0  -.02 1527.0   .17 1317.0   .51 1078.0   .23  296.0  2.97  395.0  3.35 1124.0  3.38  356.0  1.75
 WEIGHT           125.00       179.78       183.59       190.58       184.92       240.32       248.13       248.79       215.69
 WAIST BREADTH    262.87       321.66       325.74       333.24       327.16       386.62       395.00       395.70       360.19
               10 ELBOW CI  11 FOREARM   12 HAND LEN  13 FOOT LEN
                RC           CIRC         GTH          GTH
               306.0  2.12  319.0  2.63  192.0  -.13  277.0   .42
 WEIGHT           223.17       233.57       177.43       188.75
 WAIST BREADTH    368.21       379.37       319.13       331.27

SUBJECT   150
NO.  9 BICEPS CIRC        342.  262.   5.7 **  10 ELBOW CIRC        303.  217.  18.4 **  11 FOREARM CIRC       208.  307. -21.1
                1 WEIGHT     2 STATURE    3 SHOULDER    4 CHEST HE   5 WAIST HE   6 WAIST DE   7 WAIST BR   8 WAIST CI   9 BICEPS C
                                          HEIGHT        IGHT         IGHT         PTH          EADTH        RC           IRC
               204.0  1.18 1744.0  -.45 1503.0  -.23 1302.0   .24 1041.0  -.51  285.0  2.43  330.0   .37 1008.0  1.57  342.0  1.14
 BICEPS CIRC      342.93       306.07       311.12       321.70       304.62       371.32       324.54       351.89       342.00
 ELBOW CIRC       293.56       272.17       275.10       281.25       271.33       310.04       282.89       298.76       293.02
 FOREARM CIRC     299.29       277.32       280.33       286.64       276.46       316.22       288.33       304.64       298.74
               10 ELBOW CI  11 FOREARM   12 HAND LEN  13 FOOT LEN
                RC           CIRC         GTH          GTH
               303.0  1.89  208.0 -5.58  181.0 -1.37  261.0  -.99
 BICEPS CIRC      359.19       189.79       285.13       293.92
 ELBOW CIRC       303.00       204.69       260.02       265.12
 FOREARM CIRC     308.99       208.00       264.84       270.08


COMPAR FINISHED. CONTROL RETURNED TO MAIN PROGRAM
```

Figure 33. Recomputed list of subjects with aberrant values.

those errors most likely to occur. Mispunched values are easiest to correct since there is no judgment to be made if you have the original data forms. Sometimes a value is recorded so that it can be read in two or three ways. Often one value will be very close to the estimated value and can be readily corrected. Values may be recorded in the wrong place; two or more may be reversed or mixed or recorded several places out of order causing a number of variable values to be one or more positions out of place. The readily identifiable errors are those which occur when one variable must be larger than the other, as in stature and shoulder height. Where it is suggested that two values may be reversed, an estimate of one based on the other in any combination will be of no use. If both values are identified as aberrant, the list should be used to select other variables which correlate well with the two suspect values.

If a whole sequence of variables are flagged as aberrant, neither the estimates derived from the combinations nor the estimates from the list may be of much use. In such instances, estimates can be made by using the table of deviations from the mean for each variable (see Figure 32). Such estimates will be, at best, gross approximations. Stature and weight are useful for establishing the number of units of standard deviation a particular subject's measurements are from the group mean values. These variables establish the overall body size of the individual and, in general, have the fewest number of errors in a data set. If the subject is more or less of average height but two standard deviations above the mean in weight, the long-bone measurements and lengths can be estimated as approximately mean values and the circumference and breadths as the mean plus 1.5 - 2.5 standard deviations above the mean. The values so derived will often provide an adequate clue to sort out sequential data which have been misrecorded. A list of the approximate variable values can be moved up and down beside the data blank until a good match is found.

Sometimes a number will be recorded incorrectly. One or more digits may be wrong or out of order. If a value is estimated as 830 and read in as 735, a good guess is that 835 is the actual value. If a value is estimated at 585 and read in as 509, it is a good guess that 590 is the actual value. Values misread in measuring are of two types: the measurements were not made correctly or the measuring instrument was not read correctly. This program does not detect mismeasurements well, but if for a particular variable suspect values occur for several subjects measured at the same time or by the same individual, it is a good idea to check for an equipment problem or a change in method of measurement. An instrument which is not marked in hundredths is typically the cause of some measuring errors which creep into the data. For example, if most values are between 800 to 899 with only a few above and a few below, then values beginning with 7 or 9, when suspect, may be corrected to begin with 8.

While the EDIT program can sort through a massive amount of data to locate and identify deviant values, it cannot make judgments about those aberrations. It requires a knowledgeable professional to decide whether an aberrant value is in fact an error, to track down its source, if practicable, and to decide ultimately whether the value can be corrected or should be deleted.

The EDITing program is independently valuable but its optimum usefulness is achieved in conjunction with the previously described XVAL program which serves to identify the grosser errors, leaving to EDIT the task of fine sorting.

APPENDIX A

COMPUTER PRINTOUT OF THE XVAL PROGRAM

```
      PROGRAM XVAL77
     *(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE9,PUNCH,TAPE2,TAPE3)
C-----                                                                  XVAL  10
C... THE XVAL(EXTREME VALUES) PROGRAM, WHEN SUPPLIED WITH DATA IN THE   XVAL  20
C    PROPER FORM, PROVIDES THE 10 LARGEST AND 10 SMALLEST VALUES FOR    XVAL  30
C    EACH DATA VARIABLE, MEANS, STANDARD DEVIATIONS, COEFFICIENTS OF    XVAL  40
C    VARIATION, MEASURES OF THE VARIATION WITHIN THE TOP 10 VALUES AND  XVAL  50
C    THE BOTTOM 10 VALUES, MEASURES OF SKEWNESS AND KURTOSIS, (N-20)    XVAL  60
C    MEAN AND STANDARD DEVIATION ESTIMATES, AND FREQUENCY TABLE INTERVALXVAL  70
C    WIDTHS.  ITS BASIC PURPOSE IS TO PROVIDE AN INITIAL SCANNING OF A  XVAL  80
C    SET OF DATA.                                                       XVAL  90
C                                                                       XVAL 100
C-----                                                                  XVAL 110
C        THE INPUT STREAM CONSISTS OF                                   XVAL 120
C             1. THE NAMELIST "XVAL", EVEN IF IT'S EMPTY                XVAL 130
C             2. THE UNIT CARDS IF NUNIT WAS SET.GT.0 IN XVAL           XVAL 140
C             3. THE INPUT TO INA77 AND INB77                           XVAL 150
C                                                                       XVAL 160
C-----                                                                  XVAL 170
C    NORMALLY, THE ONLY CHANGES THAT WOULD BE MADE WOULD BE TO THE      XVAL 180
C    FOLLOWING DIMENSION STATEMENT WHICH SHOULD REFLECT THE MAXIMUM     XVAL 190
C    NUMBER OF VARIABLES TO BE PROCESSED.                               XVAL 200
C                                                                       XVAL 210
      DIMENSION Z(205,20),NSN(205,20),MISS(205,6),S(205,5)              XVAL 220
C-----                                                                  XVAL 230
C--- THE FOLLOWING STATEMENTS PERMIT US TO USE THE AREA WHERE MISS IS    XVAL 240
C    STORED TO STORE EM, ESD, V, TOP, BOT                               XVAL 250
C                                                                       XVAL 260
      DIMENSION EM(1),ESD(1),V(1),MQ(1),TOP(1),BOT(1)                   XVAL 270
      EQUIVALENCE (MISS(1,1),EM(1)),(MISS(1,2),ESD(1)),(MISS(1,3),V(1)),XVAL 280
     1(MQ(1),MISS(1,6)),(TOP(1),MISS(1,4)),(BOT(1),MISS(1,5) )          XVAL 290
C-----                                                                  XVAL 300
C  FROM DATUMS WE GET  (ARRAYS DIMENSIONED 205)                         XVAL 310
C   X---THE BASIC DATA                                                  XVAL 320
C    NAY---THE 18 CHARACTER VARIABLE NAMES (FORMAT:4A4,A2)              XVAL 330
C     NSUB---THE CURRENT RECORD(SUBJECT NO.)/NSUB.LE.0 SIGNALS END OF   XVAL 340
C           DATA                                                        XVAL 350
C      NV---THE NUMBER OF VARIABLES TO BE PROCESSED                     XVAL 360
C                                                                       XVAL 370
C  TO DATUMS WE GIVE                                                    XVAL 380
C   A(1)..THE BOTTOM OF THE FIRST INTERVAL FOR X(I)                     XVAL 390
C    A(2).. THE MAXIMUM VALUE FOR X(I)                                  XVAL 400
C     A(3).. AN APROXIMATE MEAN VALUE FOR X(I)                          XVAL 410
C      A(4)&A(5)..SUGGESTED INTERVAL WIDTHS FOR UNI AND BIVARIATE TABLESXVAL 420
C       A(6)&A(7)..THE UNITS TO CONVERT TO METRIC AND ENGLISH OUTPUT    XVAL 430
C        NMAX..DIMENSION VALUE FOR ARRAYS                               XVAL 440
C                                                                       XVAL 450
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             XVAL 460
C-----                                                                  XVAL 470
C  FROM HEAD WE GET                                                     XVAL 480
C   HDG---AN 80 CHARACTER LABEL (FORMAT:20A4)                           XVAL 490
C    NPG---THE PAGE NUMBER PREVIOUS TO XVAL'S FIRST PAGE OF OUTPUT      XVAL 500
C     WHEN---THE DATE (FORMAT:2A4)                                      XVAL 510
C                                                                       XVAL 520
      COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   XVAL 530
C-----                                                                  XVAL 540
      DIMENSION WYD(15),APE(14),CST(205,2),NK(1)                        XVAL 550
```

```
      EQUIVALENCE (A(1,6),CST(1,1)),(NK(1),S(1,5))                          XVAL 560
C-----                                                                      XVAL 570
C   THE NAMELIST VARIABLES AND THEIR DEFAULT VALUES                         XVAL 580
C  1...ML...IF.NE.0 MISSING VALUES ARE LISTED. IF ML.GT.0, UP TO ML         XVAL 590
C           LINES WILL BE PRINTED.  IF ML.LT.0, THERE IS NO LIMIT (0)       XVAL 600
C   2...MS...IF.GT.0, NON-CONSECUTIVE SUBJECT NUMBERS ARE LISTED (0)        XVAL 610
C    3...NR...IF.GT.0, NAME-RANGE CARDS ARE PUNCHED (0)                     XVAL 620
C     4...NP...MAXIMUM NO. OF INTERVALS-UNIVARIATE TABLES (50)              XVAL 630
C      5...NQ...MAXIMUM NO. OF INTERVALS-BIVARIATE TABLES (30)              XVAL 640
C       6...IP...THE FIRST VALUE OF WYD TO BE CONSIDERED (5)                XVAL 650
C        7...XKST...THE USUAL FACTOR FOR CONVERTING TO METRIC OUTPUT(.1)    XVAL 660
C         8...YKST...THE USUAL FACTOR FOR CONVERTING FROM METRIC TO         XVAL 670
C                 ENGLISH (.3937008)                                        XVAL 680
C          9...NUNIT...THE NUMBER OF UNIT CARDS (0)                         XVAL 690
C                                                                           XVAL 700
      NAMELIST/XVAL/ML,MS,NR,NP,NQ,XKST,YKST,IP,NUNIT                       XVAL 710
      DATA ML,MS,NR,NP,NQ,IP,NUNIT,XKST,YKST/3*0,50,30,5,0,.1,.3937008/     XVAL 720
C-----                                                                      XVAL 730
      DATA BLANK/4H*   /                                                    XVAL 740
C                                                                           XVAL 750
C  **WYD ARE A LIST OF ACCEPTABLE INTERVAL WIDTHS                           XVAL 760
      DATA WYD/.1,.2,.3,.5,1.,2.,3.,5.,10.,15.,20.,25.,30.,50.,80./         XVAL 770
C                                                                           XVAL 780
C  **SOME LABELLING                                                         XVAL 790
      DATA APE/4H1ST ,4H2ND ,4H3RD ,4H4TH ,4H5TH ,4H6TH ,4H7TH ,4H8TH ,     XVAL 800
     *         4H9TH ,4HXTH ,4HSMAL,4HLEST,4HLARG,4HEST /                   XVAL 810
C                                                                           XVAL 820
C  **FRACTN(K) IS AN EMPIRICAL FORMULA FOR USE IN ESTIMATING THE TOTAL      XVAL 830
C       GROUP STANDARD DEVIATION FROM THE CENTRAL K-20 VALUES               XVAL 840
      FRACTN(K)=1.01240-62.57892/(FLOAT(K+100))-2.57827/SQRT(FLOAT(K))      XVAL 850
C                                                                           XVAL 860
C--- THE FOLLOWING UNLIKELY VALUE OF X(1) SUPPRESSES RANGE CHECKING IN      XVAL 870
C       IN877 UNLESS IT IS SPECIFICALLY REQUESTED                           XVAL 880
      X(1)=3.14159                                                          XVAL 890
C                                                                           XVAL 900
C--- WE READ IN AND PRINT OUT THE NAMELIST XVAL                             XVAL 910
C                                                                           XVAL 920
      READ(5,XVAL)                                                          XVAL 930
      WRITE(6,XVAL)                                                         XVAL 940
      IF(ML.NE.0)WRITE(6,11)                                                XVAL 950
      IF(MS.GT.0)WRITE(6,12)                                                XVAL 960
      IF(IP.LE.4)WRITE(6,13)                                                XVAL 970
      IF(NR.GT.0)WRITE(6,14) NP,NQ                                          XVAL 980
C-----                                                                      XVAL 990
C--- WE DETERMINE THE LENGTH OF THE ARRAYS WHICH DETERMINE NMAX             XVAL1000
C                                                                           XVAL1010
      Z(1,2)=1776.1976                                                      XVAL1020
      DO 1 L=1,7777                                                         XVAL1030
      IF(Z(L,1).EQ.1776.1976)GOTO 2                                         XVAL1040
    1 CONTINUE                                                              XVAL1050
    2 NMAX=L                                                                XVAL1060
C-----                                                                      XVAL1070
      IF(NUNIT.EQ.0)GO TO 95                                                XVAL1080
C--- THE FOLLOWING WILL CAUSE ALL VARIABLES WITH NUMBERS FROM THE FIRST     XVAL1090
C    ONE LISTED TO THE SECOND ONE TO HAVE THE FOLLOWING UNIT VALUES         XVAL1100
C                                                                           XVAL1110
      DO 94 L=1,NUNIT                                                       XVAL1120
```

```
      94 READ(5,8) MISS(L,1),MISS(L,2),S(L,1),S(L,2)                    XVAL1130
      95 CONTINUE                                                       XVAL1140
C-----                                                                  XVAL1150
C     **********      WE CALL INA77      **************                 XVAL1160
C--- INA77 IS CALLED ONCE AND RETURNS THE 18 CHARACTER VARIABLE NAMES   XVAL1170
C     ((NAY(I,J),J=1,5),I=1,NW), THE NUMBER OF VARIABLES TO BE PROCESSED XVAL1180
C     (NV), THE 80 CHARACTER LABEL (HOG(J),J=1,20), AND THE DATE (WHEN(J)XVAL1190
C     ,J=1,2)                                                           XVAL1200
C                                                                       XVAL1210
      CALL INA77                                                        XVAL1220
C-----                                                                  XVAL1230
C--- DATA CONVERSION CONSTANTS ARE ASSIGNED HERE                        XVAL1240
C                                                                       XVAL1250
      DO 96 L=1,NV                                                      XVAL1260
      CST(L,1)=XKST                                                     XVAL1270
   96 CST(L,2)=YKST                                                     XVAL1280
      IF (NUNIT.EQ.0) GOTO98                                            XVAL1290
      DO 97 L=1,NUNIT                                                   XVAL1300
      I=MISS(L,1)                                                       XVAL1310
      J=MISS(L,2)                                                       XVAL1320
      DO 97 M=I,J                                                       XVAL1330
      CST(M,1)=S(L,1)                                                   XVAL1340
      CST(M,2)=S(L,2)                                                   XVAL1350
   97 CONTINUE                                                          XVAL1360
   98 CONTINUE                                                          XVAL1370
C-----                                                                  XVAL1380
C--- INITIALIZATION                                                     XVAL1390
C                                                                       XVAL1400
      DO 100 I=1,NV                                                     XVAL1410
      MQ(I)=0                                                           XVAL1420
      DO 101 J=1,5                                                      XVAL1430
  101 S(I,J)=0.0                                                        XVAL1440
      DO 102 J=1,20                                                     XVAL1450
      Z(I,J)=0.0                                                        XVAL1460
  102 NSN(I,J)=0                                                        XVAL1470
  100 CONTINUE                                                          XVAL1480
      MSUB=0                                                            XVAL1490
C-----                                                                  XVAL1500
      DO 200 KLM=1,77777                                                XVAL1510
C      WE NOW BEGIN TO READ AND PROCESS THE DATA                        XVAL1520
C     **********      WE CALL INB77      **********                     XVAL1530
C--- EACH TIME INB77 IS CALLED IT RETURNS A SUBJECT NUMBER (NSUB) AND NWXVAL1540
C     DATA VALUES (X(I),I=1,NW)                                         XVAL1550
C                                                                       XVAL1560
      CALL INB77                                                        XVAL1570
C-----                                                                  XVAL1580
C--- NSUB.LE.0 SIGNALS THE END OF THE DATA                              XVAL1590
      IF (NSUB.LE.0)GOTO 300                                            XVAL1600
C-----                                                                  XVAL1610
C--- IF A MISSING SUBJECTS LIST WAS REQUESTED, IT IS WRITTEN TO A       XVAL1620
C     SCRATCH FILE                                                      XVAL1630
C                                                                       XVAL1640
      IF (MS.GT.0.AND.NSUB.NE.MSUB+1) WRITE(2,19) MSUB,NSUB             XVAL1650
      MSUB=NSUB                                                         XVAL1660
C-----                                                                  XVAL1670
      DO 201 I=1,NV                                                     XVAL1680
      IF(X(I).NE.0.0) GOTO 202                                          XVAL1690
```

```
                      IF(ML.EQ.0) GOTO 201                                      XVAL1700
                      IF(MQ(I).LT.5) GOTO 203                                   XVAL1710
                C---- IF REQUESTED, MISSING VALUES ARE COLLECTED HERE AND WRITTEN TO A  XVAL1720
      175       C     SCRATCH FILE                                              XVAL1730
                                                                                XVAL1740
                      WRITE (3,20) I,(NAY(I,L),L=1,5),(MISS(I,L),L=1,5),NSUB    XVAL1750
                      ML=ML-1                                                   XVAL1760
                      MQ(I)=0                                                   XVAL1770
      180             GOTO 201                                                  XVAL1780
                  203 MQ(I)=MQ(I)+1                                             XVAL1790
                      MX=MQ(I)                                                  XVAL1800
                      MISS(I,MX)=NSUB                                           XVAL1810
                      GOTO 201                                                  XVAL1820
      185         202 CONTINUE                                                  XVAL1830
                C-----                                                          XVAL1840
                C---- SAMPLE SIZE FOR VARIABLE I IS UPDATED HERE                XVAL1850
                      NK(I)=NK(I)+1                                             XVAL1860
                C-----                                                          XVAL1870
      190             IF (NK(I).GT.20) GOTO 220                                 XVAL1880
                C---- THE FIRST 20 SUBJECTS DATA ARE PUT IN ASCENDING ORDER IN ARRAY Z  XVAL1890
                C     AND THEIR SUBJECT NUMBERS STORED IN THE SAME ORDER IN ARRAY NSN.  XVAL1900
                C     THIS FORMS THE BASIS AGAINST WHICH THE REST OF THE SUBJECT'S DATA  XVAL1910
                C     WILL BE CHECKED TO FIND THE 10 SMALLEST (Z(I,K),K=1,10) AND THE  XVAL1920
      195       C     TEN LARGEST (Z(I,K),K=11,20) VALUES FOR EACH VARIABLE     XVAL1930
                C                                                               XVAL1940
                      NKQ=NK(I)-1                                               XVAL1950
                      K=0                                                       XVAL1960
                  204 K=K+1                                                     XVAL1970
      200             IF(K.GT.NKQ) GOTO 205                                     XVAL1980
                      IF(X(I).GE.Z(I,K)) GOTO 204                               XVAL1990
                      DO 206 N=K,NKQ                                            XVAL2000
                      L=NK(I)+K-N                                               XVAL2010
                      NSN(I,L)=NSN(I,L-1)                                       XVAL2020
      205         206 Z(I,L)=Z(I,L-1)                                           XVAL2030
                  205 Z(I,K)=X(I)                                               XVAL2040
                      NSN(I,K)=NSUB                                             XVAL2050
                      IF (NK(I).LT.20) GOTO 201                                 XVAL2060
                C-----                                                          XVAL2070
      210       C---- HERE A MEAN VALUE IS COMPUTED FOR VARIABLE I BASED ON THE FIRST 20  XVAL2080
                C     DATA VALUES.  THE MEAN (A(I,3)) WILL BE USED FROM HERE ON TO REDUCEXVAL2090
                C     THE MAGNITUDE OF THE SUMMATIONS.  SUMMATIONS WILL BE COMPUTED AS  XVAL2100
                C     THE SUM OF (X(I)-A(I,3))**K,K=1,4.  WHEN THESE SUMMATIONS HAVE BEENXVAL2110
                C     FURTHER REDUCED IN CALCULATING THE SUMMARY STATISTICS, A(I,3) WILL  XVAL2120
      215       C     BE ADDED BACK IN                                          XVAL2130
                C                                                               XVAL2140
                      DO 207 L=1,20                                             XVAL2150
                  207 S(I,1)=S(I,1)+Z(I,L)                                      XVAL2160
                      A(I,3)=AINT(S(I,1)/20.0+0.5)                              XVAL2170
      220             DO 208 L=1,20                                             XVAL2180
                      Z9 = Z(I,L)-A(I,3)                                        XVAL2190
                C-----                                                          XVAL2200
                C---- THE REDUCED SUMMATIONS ARE NOW DONE                      XVAL2210
                C                                                               XVAL2220
      225             DO 208 K=2,4                                              XVAL2230
                  208 S(I,K)=S(I,K)+Z9**K                                       XVAL2240
                      S(I,1)=S(I,1)-20.0*A(I,3)                                 XVAL2250
                      GOTO 201                                                  XVAL2260
```

```
  220 CONTINUE                                                          XVAL2270
C-----                                                                  XVAL2280
C--- AFTER THE 20TH SUBJECT, ALL CALCULATIONS BEGIN HERE BY REOUCING    XVAL2290
C    EACH DATA VALUE (X(I)) BY A(I,3)                                  XVAL2300
C                                                                       XVAL2310
      Z9=X(I)-A(I,3)                                                    XVAL2320
      DO 221 K=1,4                                                      XVAL2330
  221 S(I,K)=S(I,K)+Z9**K                                               XVAL2340
C-----                                                                  XVAL2350
C--- THE NEXT BLOCK OF STATEMENTS ORDER THE CURRENT SUBJECTS DATA WITHINXVAL2360
C    THE BOTTOM OR TOP TEN VALUES FOR EACH VARIABLE WHEN APPROPRIATE    XVAL2370
C    THEN GO BACK FOR THE NEXT SUBJECT                                  XVAL2380
C                                                                       XVAL2390
      IF(X(I)-Z(I,10))230,201,240                                       XVAL2400
  230 DO 231 J=1,11                                                     XVAL2410
      IF(X(I).LE.Z(I,J))GOTO232                                         XVAL2420
  231 CONTINUE                                                          XVAL2430
  232 IF(J.EQ.10)GOTO233                                                XVAL2440
      L=10                                                              XVAL2450
  234 N=L-1                                                             XVAL2460
      Z(I,L)=Z(I,N)                                                     XVAL2470
      NSN(I,L)=NSN(I,N)                                                 XVAL2480
      L=L-1                                                             XVAL2490
      IF(J.LT.L)GOTO234                                                 XVAL2500
  233 Z(I,J)=X(I)                                                       XVAL2510
      NSN(I,J)=NSUB                                                     XVAL2520
      GOTO201                                                           XVAL2530
  240 IF(X(I).LE.Z(I,11))GOTO201                                        XVAL2540
      DO 241 K=1,10                                                     XVAL2550
      J=21-K                                                            XVAL2560
      IF(X(I).GE.Z(I,J))GOTO242                                         XVAL2570
  241 CONTINUE                                                          XVAL2580
  242 IF(J.LE.11)GOTO243                                                XVAL2590
      L=11                                                              XVAL2600
  244 N=L+1                                                             XVAL2610
      Z(I,L)=Z(I,N)                                                     XVAL2620
      NSN(I,L)=NSN(I,N)                                                 XVAL2630
      L=L+1                                                             XVAL2640
      IF(L.LT.J)GOTO244                                                 XVAL2650
  243 Z(I,J)=X(I)                                                       XVAL2660
      NSN(I,J)=NSUB                                                     XVAL2670
  201 CONTINUE                                                          XVAL2680
C-----                                                                  XVAL2690
  200 CONTINUE                                                          XVAL2700
C----THE DATA HAVE ALL BEEN READ IN AND PROCESSED                       XVAL2710
C--- IF REQUESTED, NON-SEQUENTIAL SUBJECT NUMBERS ARE LISTED            XVAL2720
C                                                                       XVAL2730
  300 CONTINUE                                                          XVAL2740
      WRITE(2,21)                                                       XVAL2750
   21 FORMAT(36H*                                                       XVAL2760
      END FILE 2                                                        XVAL2770
      REWIND 2                                                          XVAL2780
   27 CONTINUE                                                          XVAL2790
      READ(2,23)(X(I),I=1,9)                                            XVAL2800
   23 FORMAT(9A4)                                                       XVAL2810
      IF(X(1).EQ.BLANK)GO TO 25                                         XVAL2820
      WRITE(6,23)(X(I),I=1,9)                                           XVAL2830
```

```
      GO TO 27                                                          XVAL2840
   25 CONTINUE                                                          XVAL2850
C-----                                                                  XVAL2860
C--- IF REQUESTED, MISSING VALUES ARE LISTED                            XVAL2870
C                                                                       XVAL2880
      WRITE(3,22)                                                       XVAL2890
   22 FORMAT(1H*,101X,1H )                                              XVAL2900
      END FILE 3                                                        XVAL2910
      REWIND 3                                                          XVAL2920
   28 CONTINUE                                                          XVAL2930
      READ(3,24)(X(I),I=1,26)                                           XVAL2940
   24 FORMAT(25A4,A3)                                                   XVAL2950
      IF(X(1).EQ.BLANK)GO TO 26                                         XVAL2960
      WRITE(6,24)(X(I),I=1,26)                                          XVAL2970
      GO TO 28                                                          XVAL2980
   26 CONTINUE                                                          XVAL2990
      IF(ML.EQ.0)GOTO301                                                XVAL3000
      DO 302 L=1,NV                                                     XVAL3010
      IF(MQ(L).EQ.0)GOTO302                                             XVAL3020
      K=MQ(L)                                                           XVAL3030
      WRITE(6,20) L,(NAM(L,J),J=1,5),(MISS(L,J),J=1,K)                  XVAL3040
  302 CONTINUE                                                          XVAL3050
  301 CONTINUE                                                          XVAL3060
C-----                                                                  XVAL3070
C    **********      WE CALL TIPAGE      **********                     XVAL3080
C    TIPAGE IS CALLED ONCE.  IT PRODUCES A LIST OF DUPLICATE VARIABLE   XVAL3090
C    NAMES, A TITLE PAGE, AND AN ALPHABETIZED TABLE OF CONTENTS.  IT    XVAL3100
C    RETURNS THE PAGE NUMBER (NPG) OF THE LAST PAGE OF THE TABLE OF     XVAL3110
C    CONTENTS                                                           XVAL3120
C                                                                       XVAL3130
      CALL TIPAGE                                                       XVAL3140
C-----                                                                  XVAL3150
      DO 500 L=1,NV                                                     XVAL3160
      EM(L)=0                                                           XVAL3170
      ESD(L)=0                                                          XVAL3180
      V(L)=0                                                            XVAL3190
      TOP(L)=0                                                          XVAL3200
      BOT(L)=0                                                          XVAL3210
      IF(NK(L).EQ.0)GOTO500                                             XVAL3220
      IF(NK(L).GT.20)GOTO501                                            XVAL3230
C-----                                                                  XVAL3240
C--- IF THE SAMPLE SIZE FOR ANY VARIABLE IS LESS THAN OR EQUAL TO 20, WEXVAL3250
C    ONLY COMPUTE THE MEAN AND STANDARD DEVIATION AND NAME-RANGE CARD   XVAL3260
C    VALUES                                                             XVAL3270
C                                                                       XVAL3280
      K=NK(L)                                                           XVAL3290
      DO 502 J=1,K                                                      XVAL3300
      S(L,1)=S(L,1)+Z(L,J)                                              XVAL3310
  502 S(L,2)=S(L,2)+Z(L,J)**2                                           XVAL3320
      S(L,1)=S(L,1)/K                                                   XVAL3330
      S(L,2)=SQRT(AMAX1(0.0,S(L,2)/K-S(L,1)**2))                        XVAL3340
      A(L,1)=Z(L,1)-0.5                                                 XVAL3350
      A(L,2)=Z(L,K)                                                     XVAL3360
      A(L,3)=AINT(S(L,1)+0.5)                                           XVAL3370
      A(L,4)=A(L,2)-A(L,1)                                              XVAL3380
      A(L,5)=A(L,2)-A(L,1)                                              XVAL3390
      GOTO500                                                           XVAL3400
```

```
      501 CONTINUE                                                          XVAL3410
          IF (NK(L).LT.30)GO TO 599                                         XVAL3420
C-----                                                                      XVAL3430
C--- SUMMATIONS FOR THE N-20 VALUES ARE COMPUTED BY SUBTRACTING THE         XVAL3440
C       EXTREME VALUES AND THEIR SQUARES FROM S(K,1) AND S(K,2).  THE       XVAL3450
C       N-20 MEAN AND STANDARD DEVIATION ESTIMATES ARE THEN COMPUTED        XVAL3460
C       ALONG WITH TWO VALUES EXPRESSING THE VARIATION WITHIN THE TOP 10    XVAL3470
C       (TOP) AND THAT WITHIN THE BOTTOM 10 (BOT) VALUES AS A FRACTION      XVAL3480
C       OF THE DIFFERENCE BETWEEN THE 10TH SMALLEST AND THE 10TH LARGEST    XVAL3490
C--- WHEN THE SAMPLE SIZE FOR ANY VARIABLE IS LESS THAN 30, THESE COMPU-    XVAL3500
C    TATIONS ARE NOT DONE                                                   XVAL3510
C                                                                           XVAL3520
          DO 503 KE=1,20                                                    XVAL3530
          WHY=Z(L,KE)-A(L,3)                                                XVAL3540
          EM(L)=EM(L)+WHY                                                   XVAL3550
          ESO(L) = ESO(L) + WHY**2                                          XVAL3560
      503 CONTINUE                                                          XVAL3570
          EM(L)=S(L,1)-EM(L)                                                XVAL3580
          ESO(L)=S(L,2)-ESO(L)                                              XVAL3590
          UMB = NK(L) -20                                                   XVAL3600
          EM(L) = EM(L)/UMB                                                 XVAL3610
          ESO(L)=SQRT((AMAX1(0.0,(ESO(L)/UMB-EM(L)**2)))/FRACTN(NK(L)))     XVAL3620
          EM(L) = EM(L) + A(L,3)                                            XVAL3630
          XMID=Z(L,11)-Z(L,10)+0.000001                                     XVAL3640
          TOP(L)=(Z(L,10)-Z(L,1))/XMID                                      XVAL3650
          BOT(L)=(Z(L,20)-Z(L,11))/XMID                                     XVAL3660
      599 CONTINUE                                                          XVAL3670
C-----                                                                      XVAL3680
C--- OVERALL MEAN, STANDARD DEVIATION, COEFFICIENT OF VARIATION, AND THE    XVAL3690
C    MEASURES OF SKEWNESS AND KURTOSIS ARE COMPUTED HERE                    XVAL3700
C                                                                           XVAL3710
          XN=NK(L)                                                          XVAL3720
          DO 320 J=1,4                                                      XVAL3730
      320 S(L,J)=S(L,J)/XN                                                  XVAL3740
          S2=S(L,1)**2                                                      XVAL3750
          S(L,4)=S(L,4)-4.0*S(L,1)*S(L,3)+6.0*S(L,2)*S2-3.0*S2**2           XVAL3760
          S(L,3)=S(L,3)-3.0*S(L,1)*S(L,2)+2.0*S2*S(L,1)                     XVAL3770
          S(L,2)=S(L,2)-S2                                                  XVAL3780
          S(L,1)=S(L,1)+A(L,3)                                              XVAL3790
          A(L,3)=AINT(S(L,1)+0.5)                                           XVAL3800
          IF(S(L,2).GT.0.)GO TO 307                                         XVAL3810
          DO 308 J=2,4                                                      XVAL3820
      308 S(L,J)=0.0                                                        XVAL3830
          V(L)=0.0                                                          XVAL3840
          GO TO 309                                                         XVAL3850
      307 CONTINUE                                                          XVAL3860
          S(L,4)=S(L,4)/S(L,2)**2                                           XVAL3870
          S(L,2)=SQRT(S(L,2))                                               XVAL3880
          S(L,3)=S(L,3)/S(L,2)**3                                           XVAL3890
          V(L)=100.0*S(L,2)/S(L,1)                                          XVAL3900
      309 CONTINUE                                                          XVAL3910
C-----                                                                      XVAL3920
C--- COMPUTION OF RECOMMENDED INTERVAL WIDTHS BEGINS HERE                   XVAL3930
C--- RANGE=JUST THAT.  NP= MAXIMUM NUMBER OF INTERVALS ALLOWED.  IF        XVAL3940
C      IP.LE.4 FRACTIONAL WIDTHS ARE ACCEPTABLE.                            XVAL3950
C--- USUALLY THE SELECTED WIDTH WILL BE THE SMALLEST VALUE IN WYO LARGER    XVAL3960
C      THAN RANGE/NP, STARTING WITH WYO(IP)                                 XVAL3970
```

```
      C--- IF RANGE/NP.GT.WYO(15), AWIO IS THE SMALLEST INTEGER MULTIPLE OF   XVAL3980
      C      100 THAT WILL WORK                                              XVAL3990
      C                                                                      XVAL4000
            A(L,2)=Z(L,20)                                                   XVAL4010
            RANGE=A(L,2)-Z(L,1)                                              XVAL4020
            ZQ=RANGE/NP                                                      XVAL4030
            DO 79 LL=IP,15                                                   XVAL4040
            IF (ZQ.LT.WYO(LL)) GO TO 81                                      XVAL4050
         79 CONTINUE                                                         XVAL4060
        971 A(L,1)=100.*AINT(Z(L,1)/100.0)-2.5                               XVAL4070
            AWID=100.0*AINT((A(L,2)-A(L,1))/(100.0*NP))+100.                 XVAL4080
            GO TO 82                                                         XVAL4090
         81 AWID=WYD(LL)                                                     XVAL4100
      C                                                                      XVAL4110
      C--- THE LOWER LIMIT OF THE FIRST INTERVAL IS CHOSEN AS AN APPROPRIATE XVAL4120
      C       FRACTION, BELOW AN INTEGER MULTIPLE OF THE INTERVAL WIOTH      XVAL4130
      C--- THESE FRACTIONS ARE 2.5 FOR AWIO.GE.5, 0.05 FOR AWID.LT.1,        XVAL4140
      C       0.5 OTHERWISE                                                  XVAL4150
      C                                                                      XVAL4160
            DEL=.5                                                           XVAL4170
            IF (AWID.GE.5.)DEL=2.5                                           XVAL4180
            IF(AWIO.LT.1.0) DEL=0.05                                         XVAL4190
            A(L,1)=AWIO*AINT(Z(L,1)/AWID)-DEL                                XVAL4200
            IF(A(L,1).GT.Z(L,1))A(L,1)=A(L,1)-AWIO                           XVAL4210
            IF(A(L,1)+AWID.LT.Z(L,1))A(L,1)=A(L,1)+AWIO                      XVAL4220
            IF(A(L,2)-A(L,1).LE.NP*AWIO)GOTO 82                              XVAL4230
            LL=LL+1                                                          XVAL4240
            IF(LL.EQ.16) GO TO 971                                           XVAL4250
            GO TO 81                                                         XVAL4260
         82 ZQ=(A(L,2)-A(L,1))/NQ                                            XVAL4270
            DO 504 LL=IP,15                                                  XVAL4280
            IF(ZQ.LT.WYO(LL))GOTO91                                          XVAL4290
        504 CONTINUE                                                         XVAL4300
            BWID=100.*AINT((A(L,2)-A(L,1))/(100.*NQ))+100.                   XVAL4310
            GO TO 92                                                         XVAL4320
         91 BWIO=WYO(LL)                                                     XVAL4330
         92 CONTINUE                                                         XVAL4340
            A(L,4)=BWIO                                                      XVAL4350
            A(L,5)=AWIO                                                      XVAL4360
        500 CONTINUE                                                         XVAL4370
      C-----                                                                 XVAL4380
      C------------ WE BEGIN TO PRINT OUT THE RESULTS                        XVAL4390
      C                                                                      XVAL4400
            DO 600 L=1,NV,8                                                  XVAL4410
            K=MINO(L+7,NV)                                                   XVAL4420
            WRITE(6,30)L,K                                                   XVAL4430
            WRITE(6,31)(J,J=L,K)                                             XVAL4440
            WRITE(6,32)((NAY(J,JJ),JJ=1,2),J=L,K)                            XVAL4450
            WRITE(6,52)((NAY(J,JJ),JJ=3,5),J=L,K)                            XVAL4460
            WRITE(6,33)                                                      XVAL4470
            DO 601KK=1,10                                                    XVAL4480
        601 WRITE(6,34) APE(KK),APE(11),APE(12),(Z(J,KK),NSN(J,KK),J=L,K)    XVAL4490
            WRITE(6,35)                                                      XVAL4500
            DO 602 KK=11,20                                                  XVAL4510
            KL=21-KK                                                         XVAL4520
        602 WRITE(6,34) APE(KL),APE(13),APE(14),(Z(J,KK),NSN(J,KK),J=L,K)    XVAL4530
            WRITE(6,36) (S(J,1),J=L,K)                                       XVAL4540
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                WRITE(6,37) (S(J,2),J=L,K)                                      XVAL4550
                WRITE(6,38) (V(J),  J=L,K)                                      XVAL4560
                WRITE(6,39) (TOP(J),J=L,K)                                      XVAL4570
460             WRITE(6,40) (BOT(J),J=L,K)                                      XVAL4580
                WRITE(6,41) (S(J,3),J=L,K)                                      XVAL4590
                WRITE(6,42) (S(J,4),J=L,K)                                      XVAL4600
                WRITE(6,43) (EM(J), J=L,K)                                      XVAL4610
                WRITE(6,44) (ESO(J),J=L,K)                                      XVAL4620
465             DO 603 J=L,K                                                    XVAL4630
                Z(J,11)=0.0                                                     XVAL4640
                Z(J,12)=0.0                                                     XVAL4650
                IF(ESO(J).EQ.0.0)GOTO603                                        XVAL4660
                Z(J,11)=100.0*(S(J,1)-EM(J))/ESD(J)                             XVAL4670
470             Z(J,12)=100.0*(S(J,2)-ESD(J))/ESO(J)                            XVAL4680
              603 CONTINUE                                                      XVAL4690
                WRITE(6,45) (Z(J,11),J=L,K)                                     XVAL4700
                WRITE(6,46) (Z(J,12),J=L,K)                                     XVAL4710
                WRITE(6,47) (NK(J),  J=L,K)                                     XVAL4720
475             NPG=NPG+1                                                       XVAL4730
                WRITE(6,53) WHEN,HOG,NPG                                        XVAL4740
              600 CONTINUE                                                      XVAL4750
            C-----                                                              XVAL4760
            C  PRINT OUT A SUMMARY                                              XVAL4770
480         C                                                                   XVAL4780
                DO 700 L=1,NV,50                                                XVAL4790
                K=MIN0(NV,L+49)                                                 XVAL4800
                WRITE(6,51)                                                     XVAL4810
                DO 701 MM=L,K                                                   XVAL4820
485             A(MM,2)=A(MM,2)+.00499                                          XVAL4830
                WRITE(6,49) MM,(NAY(MM,J),J=1,5),(S(MM,J),J=1,4),V(MM),Z(MM,11),  XVAL4840
               *Z(MM,12),NK(MM),Z(MM,1),(A(MM,J),J=1,7)                         XVAL4850
              701 CONTINUE                                                      XVAL4860
                NPG=NPG+1                                                       XVAL4870
490             LL=L+51                                                         XVAL4880
                DO 702 MM=K,LL                                                  XVAL4890
              702 WRITE(6,32)                                                   XVAL4900
                WRITE(6,48)WHEN,HDG,NPG                                         XVAL4910
              700 CONTINUE                                                      XVAL4920
495             IF(NR.EQ.0)STOP                                                 XVAL4930
            C-----                                                              XVAL4940
            C....ANO NOW TO PUNCH OUT RANGE & NAME CAROS IF ANYBOOY ASKEO FOR THEM  XVAL4950
            C                                                                   XVAL4960
                DO 800 L=1,NV                                                   XVAL4970
500           800 PUNCH 50,L,(NAY(L,J),J=1,5),(A(L,J),J=1,7)                    XVAL4980
            C-----                                                              XVAL4990
            C                                                                   XVAL5000
                STOP                                                            XVAL5010
                8 FORMAT(2I5,2F10.7)                                            XVAL5020
505            11 FORMAT(/44H ML.NE.0--MISSING VALUE LIST WILL BE PRINTEO)      XVAL5030
               12 FORMAT(/48H MS.GT.0--NON-SEQUENTIAL SUBJECTS WILL BE LISTEO)  XVAL5040
               13 FORMAT(/39H IP.LE.4--FRACTIONAL INTERVALS POSSIBLE)           XVAL5050
               14 FORMAT(/42H NR.GT.0--NAME RANGE CAROS WILL BE PUNCHEO/38H MAXIMUM XVAL5060
                 *NUMBERS OF INTERVALS WILL BE, I3,2H &,I3)                     XVAL5070
510            19 FORMAT(20H **NO RECORO BETWEEN,I6,4H ANO,I6)                  XVAL5080
               20 FORMAT(27H NO VALUES FOR VARIABLE NO.,I4,2H, ,4A4,A2,16H FOR RECORXVAL5090
                 *OS NO.,6I6)                                                   XVAL5100
               30 FORMAT (1H1/////35X,24HSTATISTICS FOR VARIABLES,I5,2X7HTHROUGH I5/XVAL5110
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                *///1H )                                                          XVAL5120
    515         31 FORMAT (1H0,8X,8I13)                                          XVAL5130
                32 FORMAT(11X,8(5X,2A4))                                         XVAL5140
                33 FORMAT(13X,8(13H  VALUE SBJCT))                               XVAL5150
                34 FORMAT(1X,3A4,8(F8.1,I5))                                     XVAL5160
                35 FORMAT(4X,6H******)                                           XVAL5170
    520         36 FORMAT (1H0,14HTHE MEAN VALUE F9.2,7F13.2)                    XVAL5180
                37 FORMAT(1X,14HSTD. DEVIATION,F9.2,7F13.2)                      XVAL5190
                38 FORMAT(1X,14HCOFF/VARIATION,F9.2,7F13.2)                      XVAL5200
                39 FORMAT(4X,7H''TOP'',F13.2,7F13.2)                             XVAL5210
                40 FORMAT(4X,7H''BOT'',F13.2,7F13.2)                             XVAL5220
    525         41 FORMAT (3X,8HVETA ONE,F13.2,7F13.2)                           XVAL5230
                42 FORMAT (3X,8HVETA TWO,F13.2,7F13.2)                           XVAL5240
                43 FORMAT (15H0(N-20)-AVG EST,F9.2,7F13.2)                       XVAL5250
                44 FORMAT(15H (N-20)-S.D.EST,F9.2,7F13.2)                        XVAL5260
                45 FORMAT(15H0PCT DIFF/MEANS,F9.0,7F13.0)                        XVAL5270
    530         46 FORMAT(15H PCT DIF/ST DVS,F9.0,7F13.0)                        XVAL5280
                47 FORMAT (15HOSIZE OF SAMPLE,I9,7I13)                           XVAL5290
                48 FORMAT(3(1H /),1X,2A4,10X,20A4,12X,4HPAGE,I4)                 XVAL5300
                49 FORMAT(I4,1X,4A4,A2,F8.2,F7.2,2F5.2,F5.1,1H%,2F5.1,I5,F7.1,3F6.1 XVAL5310
                  *,2F8.2,2F8.5)                                                 XVAL5320
    535         50 FORMAT(I4,2X,4A4,A2,3F8.2,2F6.2,2F10.7)                       XVAL5330
                51 FORMAT (1H1,12X,105HA SUMMARY OF THE MATERIAL ALREADY PRESENTED EIXVAL5340
                  *THER ON THE PRECEDING PAGES OR ON THE PUNCHED RANGE CARDS     XVAL5350
                  *//80X,27H---THE RANGE CARD VALUES---      /                   XVAL5360
                  *5H  NO.,1X,13HVARIABLE NAME,6X,4HMEAN,2X,7HSTD DEV,2X,3HV-I,  XVAL5370
    540           *1X,4HV-II,3X,1HV,3X,4HDELM,1X,4HDELS,3X,1HN,1X,7HMINIMUM,     XVAL5380
                  *2X,3HMIN,4X,3HMAX,3X,3HAVG,3X,5HINTV1,3X,6HINTV2 ,4X,3HCF1,5X,4HCFXVAL5390
                  *2 )                                                           XVAL5400
                52 FORMAT(13X,8(3X,2A4,A2))                                      XVAL5410
                53 FORMAT(8(1H /),1X,2A4,10X,20A4,12X,4HPAGE,I4)                 XVAL5420
    545            END                                                           XVAL5430
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS

		DEF LINE	REFERENCES
14321	XVAL77	1	

VARIABLES

		SN	TYPE		RELOCATION							
2316	A		REAL	ARRAY	DATUMS	REFS	48	58	221	227	234	2*340	2*341
							356	365	381	404	2*410	2*423	2*424	2*425
							2*429	2*433	485	486	500	DEFINED	219	337
							338	339	340	341	382	403	409	422
							423	424	437	438	485			
43354	APE		REAL	ARRAY		REFS	57	3*451	3*455	DEFINED	82			
16777	AWID		REAL			REFS	420	421	2*422	423	2*424	425	438	
						DEFINED	410	412						
16064	BLANK		REAL			REFS	284	298	DEFINED	76				
20472	BOT		REAL	ARRAY		REFS	29	30	460	DEFINED	323	368		
17001	BWID		REAL			REFS	437	DEFINED	433	435				
4317	CST		REAL	ARRAY	DATUMS	REFS	57	58	DEFINED	129	130	136	137	
17000	DEL		REAL			REFS	422	DEFINED	419	420	421			
17006	EM		REAL	ARRAY		REFS	29	30	357	360	363	364	365	

VARIABLES	SN	TYPE	RELOCATION						
				463	469	DEFINED	319	357	360	363	365
17323 ESD		REAL	ARRAY	REFS	29	30	358	361	364	464	468
				469	2*470	DEFINED	320	358	361	364	
0 HDG		REAL	ARRAY HEAD	REFS	55	476	493				
16754 I		INTEGER		REFS	135	144	146	148	149	171	173
				3*177	179	2*181	182	183	2*188	190	197
				2*201	203	2*204	2*205	2*206	207	208	3*218
				2*219	2*221	2*226	3*227	2*234	2*236	2*242	2*244
				2*249	2*250	2*253	254	2*256	2*259	2*264	2*265
				2*268	269	282	285	296	299		
				DEFINED	133	143	170	282	285	296	299
16060 IP		INTEGER		REFS	73	99	406	430	DEFINED	74	
16755 J		INTEGER		REFS	135	146	148	149	244	246	252
				253	254	259	261	267	268	269	2*306
				333	334	2*376	385	446	447	448	2*451
				2*455	456	457	458	459	460	461	462
				463	464	466	467	468	4*469	4*470	472
				473	474	3*486	2*500	DEFINED	134	145	147
				243	258	2*306	332	375	384	446	447
				448	451	455	456	457	458	459	460
				461	462	463	464	465	472	473	474
				3*486	2*500						
17002 JJ		INTEGER		REFS	447	448	DEFINED	447	448		
16763 K		INTEGER		REFS	199	200	201	202	203	206	207
				3*226	3*236	258	306	332	335	336	338
				445	446	447	448	451	455	456	457
				458	459	460	461	462	463	464	465
				472	473	474	484	491	DEFINED	198	199
				225	235	257	305	331	444	482	
16766 KE		INTEGER		REFS	356	DEFINED	355				
17003 KK		INTEGER		REFS	3*451	454	2*455	DEFINED	450	453	
17004 KL		INTEGER		REFS	455	DEFINED	454				
16760 KLM	*	INTEGER		DEFINED	153						
16753 L		INTEGER		REFS	106	108	4*115	129	130	133	134
				136	137	2*177	2*204	2*205	218	221	248
				249	250	251	252	263	264	265	266
				267	304	305	3*306	319	320	321	322
				323	324	325	331	3*333	3*334	2*335	3*336
				2*337	2*338	2*339	3*340	3*341	344	2*356	2*357
				2*358	3*360	3*361	362	2*363	5*364	3*365	2*366
				3*367	3*368	374	2*376	377	5*378	5*379	2*380
				3*381	2*382	383	385	386	3*389	2*390	3*391
				3*392	2*403	2*404	2*409	2*410	2*422	4*423	4*424
				2*425	2*429	2*433	437	438	444	445	446
				447	448	451	455	456	457	458	459
				460	461	462	463	464	465	472	473
				474	482	484	490	3*500	DEFINED	105	114
				128	132	2*177	203	217	220	247	251
				262	266	303	318	443	481	499	
16776 LL		INTEGER		REFS	407	412	426	427	431	435	491
				DEFINED	406	426	430	490			
16756 M		INTEGER		REFS	136	137	DEFINED	135			
17006 MISS		INTEGER	ARRAY	REFS	24	6*30	133	134	177	306	
				DEFINED	2*115	183					
16053 ML		INTEGER		REFS	73	97	172	178	302		
				DEFINED	74	178					
17005 MM		INTEGER		REFS	2*485	9*486	DEFINED	484	491		

VARIABLES	SN	TYPE	RELOCATION							
21007	MQ	INTEGER	ARRAY	REFS	29	30	173	181	182	304	305
				DEFINED	144	179	181				
16054	MS	INTEGER		REFS	73	98	167	DEFINED	74		
16757	MSUB	INTEGER		REFS	2*167	DEFINED	151	168			
16761	MX	INTEGER		REFS	183	DEFINED	182				
16764	N	INTEGER		REFS	203	249	250	264	265		
				DEFINED	202	248	263				
315	NAY	INTEGER	ARRAY DATUMS	REFS	48	177	306	447	448	486	500
23010	NK	INTEGER	ARRAY	REFS	57	58	188	190	197	203	208
					324	325	331	344	362	2*364	374	474
					486	DEFINED	188				
16762	NKQ	INTEGER		REFS	200	202	DEFINED	197			
5152	NMAX	INTEGER	DATUMS	REFS	48	DEFINED	108				
16056	NP	INTEGER		REFS	73	100	405	410	425		
				DEFINED	74						
24	NPG	INTEGER	HEAD	REFS	55	475	476	489	493		
				DEFINED	475	489					
16057	NQ	INTEGER		REFS	73	100	429	433	DEFINED	74	
16055	NR	INTEGER		REFS	73	100	495	DEFINED	74		
33331	NSN	INTEGER	ARRAY	REFS	24	204	250	265	451	455	
				DEFINED	149	204	207	250	254	265	269
5153	NSUB	INTEGER	DATUMS	REFS	48	162	2*167	168	177	183	207
					254	269					
16061	NUNIT	INTEGER		REFS	73	110	114	131	132		
				DEFINED	74						
5151	NV	INTEGER	DATUMS	REFS	48	128	143	170	303	318	443
					444	481	482	499			
16774	RANGE	REAL		REFS	405	DEFINED	404				
21324	S	REAL	ARRAY	REFS	24	58	136	137	218	219	226
					227	236	333	334	335	2*336	339	360
					361	376	377	4*378	4*379	380	381	382
					383	2*389	390	2*391	2*392	456	457	461
					462	469	470	486	DEFINED	2*115	146	218
					226	227	236	333	334	335	336	376
					378	379	380	381	385	389	390	391
16773	S2	REAL		REFS	2*378	379	380	DEFINED	377		
20155	TOP	REAL	ARRAY	REFS	29	30	459	DEFINED	322	367	
16770	UMB	REAL		REFS	363	364	DEFINED	362			
17640	V	REAL	ARRAY	REFS	29	30	458	486	DEFINED	321	386
					392						
25	WHEN	REAL	ARRAY HEAD	REFS	55	476	493				
16767	WHY	REAL		REFS	357	358	DEFINED	356			
43335	WYD	REAL	ARRAY	REFS	57	407	412	431	435		
				DEFINED	79						
0	X	REAL	ARRAY DATUMS	REFS	48	171	201	206	234	242	244
					253	256	259	268	284	285	298	299
				DEFINED	91	282	296				
16062	XKST	REAL		REFS	73	129	DEFINED	74			
16771	XMID	REAL		REFS	367	368	DEFINED	366			
16772	XN	REAL		REFS	376	DEFINED	374				
16063	YKST	REAL		REFS	73	130	DEFINED	74			
23325	Z	REAL	ARRAY	REFS	24	106	201	205	218	221	242
					244	249	256	259	264	333	334	337
					338	356	2*366	2*367	2*368	403	404	409
					422	423	424	451	455	472	473	3*486
				DEFINED	104	148	205	206	249	253	264	
					268	466	467	469	470			

VARIABLES SN TYPE RELOCATION

16775	ZQ	REAL	REFS	407	431	DEFINED	405	429			
16765	Z9	REAL	REFS	226	236	DEFINED	221	234			

FILE NAMES MODE

0	INPUT									
2041	OUTPUT									
6143	PUNCH	FMT	WRITES	500						
10204	TAPE2	FMT	WRITES	167	277	READS	282	MOTION	279	280
12245	TAPE3	FMT	WRITES	177	291	READS	296	MOTION	293	294
0	TAPE5	MIXED	READS	95	115					
2041	TAPE6	MIXED	WRITES	96	97	98	99	100	285	299
				306	445	446	447	448	449	451
				452	455	456	457	458	459	460
				461	462	463	464	472	473	474
				476	483	486	492	493		
4102	TAPE9									

EXTERNALS TYPE ARGS REFERENCES

INA77		0		124		
INB77		0		159		
SQRT	REAL	1	LIBRARY	336	2*364	390
TIPAGE		0		316		

INLINE FUNCTIONS TYPE ARGS DEF LINE REFERENCES

AINT	REAL	1	INTRIN		219	339	382	409	410
AMAX1	REAL	0	INTRIN		336	364			
FLOAT	REAL	1	INTRIN		2*364				
FRACTN	REAL	1	SF	87	364				
MIN0	INTEGER	0	INTRIN		444	482			

NAMELISTS DEF LINE REFERENCES

XVAL	73	95 96

STATEMENT LABELS DEF LINE REFERENCES

0	1		107	105	
14354	2		108	106	
16440	8	FMT	504	115	
16443	11	FMT	505	97	
16451	12	FMT	506	98	
16460	13	FMT	507	99	
16466	14	FMT	508	100	
16501	19	FMT	510	167	
16506	20	FMT	511	177	306
16144	21	FMT	278	277	
16172	22	FMT	292	291	
16161	23	FMT	283	282	285
16204	24	FMT	297	296	299
14762	25		287	284	
14777	26		301	298	
14753	27		281	286	
14770	28		295	300	
16516	30	FMT	513	445	
16526	31	FMT	515	446	
16531	32	FMT	516	447	492
16534	33	FMT	517	449	
16540	34	FMT	518	451	455
16543	35	FMT	519	452	
16546	36	FMT	520	456	

STATEMENT	LABELS		DEF LINE	REFERENCES							
16553	37	FMT	521	457							
16560	38	FMT	522	458							
16565	39	FMT	523	459							
16571	40	FMT	524	460							
16575	41	FMT	525	461							
16601	42	FMT	526	462							
16605	43	FMT	527	463							
16612	44	FMT	528	464							
16617	45	FMT	529	472							
16624	46	FMT	530	473							
16631	47	FMT	531	474							
16635	48	FMT	532	493							
16642	49	FMT	533	486							
16652	50	FMT	535	500							
16657	51	FMT	536	483							
16717	52	FMT	543	448							
16722	53	FMT	544	476							
0	79		408	406							
15262	81		412	407	428						
15320	82		429	411	425						
15341	91		435	431							
15343	92		436	434							
0	94		115	114							
14374	95		116	110							
0	96		130	128							
0	97		138	132	135						
14426	98		139	131							
0	100		150	143							
0	101		146	145							
0	102		149	147							
0	200		272	153							
14740	201		270	170	172	180	184	208	228	242	255	256
14535	202		185	171							
14527	203		181	173							
14543	204		199	201							
14566	205		206	200							
0	206		205	202							
0	207		218	217							
0	208		226	220	225						
14636	220		229	190							
0	221		236	235							
0	230	INACTIVE	243	242							
0	231		245	243							
14664	232		246	244							
14677	233		253	246							
14667	234		248	252							
14704	240		256	242							
0	241		260	257							
14720	242		261	259							
14733	243		268	261							
14723	244		263	267							
14745	300		276	162							
15035	301		308	302							
15032	302		307	303	304						
15223	307		388	383							
0	308		385	384							
15233	309		393	387							

STATEMENT LABELS		DEF LINE	REFERENCES		
0	320	376	375		
15346	500	439	318	324	342
15101	501	343	325		
0	502	334	332		
0	503	359	355		
0	504	432	430		
15155	599	369	344		
0	600	477	443		
0	601	451	450		
0	602	455	453		
15625	603	471	465	468	
0	700	494	481		
0	701	488	484		
0	702	492	491		
0	800	500	499		
15247	971	409	427		

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
14347	1	*	L	105 107	5B	INSTACK EXITS
14360	94	*	L	114 115	14B	EXT REFS
14400	96		L	128 130	4B	INSTACK
14407	97	*	L	132 138	17B	NOT INNER
14417	97		M	135 138	4B	INSTACK
14427	100	*	I	143 150	24B	NOT INNER
14435	101		J	145 146	2B	INSTACK
14444	102		J	147 149	3B	INSTACK
14455	200	*	KLM	153 272	270B	EXT REFS EXITS NOT INNER
14470	201	*	I	170 270	253B	EXT REFS NOT INNER
14477		*	L	177 177	11B	EXT REFS
14511		*	L	177 177	11B	EXT REFS
14556	206		N	202 205	7B	INSTACK
14602	207		L	217 218	3B	INSTACK
14613	208	*	L	220 226	17B	EXT REFS NOT INNER
14620	208	*	K	225 226	10B	EXT REFS
14642	221	*	K	235 236	10B	EXT REFS
14656	231	*	J	243 245	6B	INSTACK EXITS
14710	241	*	K	257 260	10B	OPT EXITS
15001	302	*	L	303 307	34B	EXT REFS NOT INNER
15006		*	J	306 306	11B	EXT REFS
15020		*	J	306 306	11B	EXT REFS
15037	500	*	L	318 439	312B	EXT REFS NOT INNER
15054	502		J	332 334	4B	INSTACK
15112	503		KE	355 359	6B	INSTACK
15164	320		J	375 376	3B	INSTACK
15216	308		J	384 385	2B	INSTACK
15242	79	*	LL	406 408	5B	INSTACK EXITS
15325	504	*	LL	430 432	5B	INSTACK EXITS
15352	600	*	L	443 477	310B	EXT REFS NOT INNER
15363		*	J	446 446	4B	EXT REFS
15374		*	J	447 447	14B	EXT REFS NOT INNER
15375		*	JJ	447 447	11B	EXT REFS
15415		*	J	448 448	14B	EXT REFS NOT INNER
15416		*	JJ	448 448	11B	EXT REFS
15435	601	*	KK	450 451	26B	EXT REFS NOT INNER
15444		*	J	451 451	13B	EXT REFS
15465	602	*	KK	453 455	27B	EXT REFS NOT INNER
15475		*	J	455 455	13B	EXT REFS

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES		
15616	603		J	465 471	108	OPT		
15663	700	*	L	481 494	1048	EXT REFS	NOT INNER	
15672	701	*	MM	484 488	608	EXT REFS	NOT INNER	
15677		*	J	486 486	118	EXT REFS		
15711		*	J	486 486	118	EXT REFS		
15735		*	J	486 486	118	EXT REFS		
15756	702	*	MM	491 492	58	EXT REFS		
15772	800	*	L	499 500	328	EXT REFS	NOT INNER	
15775		*	J	500 500	118	EXT REFS		
16007		*	J	500 500	118	EXT REFS		

COMMON BLOCKS	LENGTH	MEMBERS	- BIAS	NAME	(LENGTH)						
DATUMS	2668		0	X	(205)	205	NAY	(1025)	1230	A	(1435)
			2665	NV	(1)	2666	NMAX	(1)	2667	NSUB	(1)
HEAD	23		0	HDG	(20)	20	NPG	(1)	21	WHEN	(2)

	EQUIV CLASSES	LENGTH	MEMBERS	- BIAS	NAME	(LENGTH)						
	MISS	1230		0	EM	(1)	205	ESD	(1)	410	V	(1)
				615	TOP	(1)	820	BOT	(1)	1025	MQ	(1)
	S	1025		820	NK	(1)						
X	A	1435		1025	CST	(410)						

STATISTICS

PROGRAM LENGTH	270638	11827
BUFFER LENGTH	143078	6343
CM LABELED COMMON LENGTH	52038	2691

```
      1              BLOCK DATA                                                        DATA  10
                     COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   DATA  20
                     COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                          DATA  30
                     DATA ISUE,INK,WHEN/-1,0,2*4H     /                                DATA  40
      5              DATA NL/2*0,77777,5,100,0,1,777,0,1,4*0,1492,0/                   DATA  50
                     DATA F1/4H (I4,4H,2X,,4H4A4,,4HA2,3,4HF8.2,4H,2F6,4H.2,2,4HF10.,2HDATA  60
                    *7),11*1H /                                                        DATA  70
                     END                                                               DATA  80
```

96

SYMBOLIC REFERENCE MAP (R=3)

VARIABLES	SN	TYPE		RELOCATION					
0	F1	REAL	ARRAY	IN	REFS	3	DEFINED	6	
24	F2	REAL	ARRAY	IN	REFS	3			
0	HDG	REAL	ARRAY	HEAD	REFS	2			
211	INK	INTEGER		IN	REFS	3	DEFINED	4	
210	ISUE	INTEGER		IN	REFS	3	DEFINED	4	
170	NL	INTEGER	ARRAY	IN	REFS	3	DEFINED	5	
24	NPG	INTEGER		HEAD	REFS	2			
25	WHEN	REAL	ARRAY	HEAD	REFS	2	DEFINED	4	

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)					
HEAD	23	0	HDG	(20)	20	NPG	(1)	21	WHEN (2)
IN	138	0	F1	(20)	20	F2	(100)	120	NL (16)
		136	ISUE	(1)	137	INK	(1)		

STATISTICS

PROGRAM LENGTH	08	0
CM LABELED COMMON LENGTH	2418	161

```
      SUBROUTINE TIPAGE                                                 TIPG  10
C... TIPAGE CREATES A TITLE PAGE, AND AN ALPHABETIZED TABLE OF CONTENTS TIPG  20
C---     IT REQUIRES...                                                 TIPG  30
C        THE NUMBER OF VARIABLE NAMES TO BE PROCESSED (NV)              TIPG  40
C        MAXIMUM 18-CHARACTER VARIABLE NAMES OF THE FORM ((NAY(I,J),    TIPG  50
C            J=1,5),I=1,NV), FORMAT(4A4,A2)                             TIPG  60
C        AN 80-CHARACTER LABEL (HDG(J),J=1,20), FORMAT(20A4)            TIPG  70
C                                                                       TIPG  80
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             TIPG  90
      COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   TIPG 100
C                                                                       TIPG 110
C--- ARRAY K USES THE SPACE WHERE THE DATA WILL BE READ INTO (ARRAY X), TIPG 120
C    TO STORE THE VARIABLE NUMBERS OF THE ALPHABETIC ARRANGEMENT OF THE TIPG 130
C    VARIABLE NAMES                                                     TIPG 140
      DIMENSION K(205)                                                  TIPG 150
      EQUIVALENCE (X,K)                                                 TIPG 160
C                                                                       TIPG 170
C--- THIS LOOP CONTAINS THE ALPHABETIZING PROCESSING.  THE ORDER OF THE TIPG 180
C    NAMES IN ARRAY NAY IS NOT CHANGED, BUT THE SEQUENCE OF THEIR       TIPG 190
C    VARIABLE NUMBERS FROM THEIR ALPHABETIC ARRANGEMENT IS MAINTAINED   TIPG 200
C    IN ARRAY K                                                         TIPG 210
C                                                                       TIPG 220
      NPP=8                                                             TIPG 230
      NPG=0                                                             TIPG 240
      K(1)=1                                                            TIPG 250
      DO 1 I=2,NV                                                       TIPG 260
      ILESS1=I-1                                                        TIPG 270
      DO 2 J=1,ILESS1                                                   TIPG 280
      L=K(J)                                                            TIPG 290
      DO 3 M=1,5                                                        TIPG 300
      IF(NAY(L,M)-NAY(I,M))2,3,17                                       TIPG 310
    3 CONTINUE                                                          TIPG 320
      WRITE (6,103)L,I,(NAY(L,M),M=1,5)                                 TIPG 330
    2 CONTINUE                                                          TIPG 340
    5 K(I)=I                                                            TIPG 350
      GO TO 1                                                           TIPG 360
   17 JL=I-J                                                            TIPG 370
      DO 6 M=1,JL                                                       TIPG 380
      KK=I-M+1                                                          TIPG 390
    6 K(KK)=K(KK-1)                                                     TIPG 400
      K(J)=I                                                            TIPG 410
    1 CONTINUE                                                          TIPG 420
C-----                                                                  TIPG 430
C--- FIRST THE TITLE PAGE IS PRODUCED                                   TIPG 440
C                                                                       TIPG 450
      WRITE(6,100)                                                      TIPG 460
      WRITE(6,101) HDG,WHEN                                             TIPG 470
C-----                                                                  TIPG 480
C-----                                                                  TIPG 490
C--- THE TABLE OF CONTENTS IS NOW PRINTED                               TIPG 500
C                                                                       TIPG 510
      I5=(NV-1)/100+2                                                   TIPG 520
      DO 6500 M=1,NV,100                                                TIPG 530
      WRITE (6,105)                                                     TIPG 540
6513  N=MIN0(100,NV-M+1)                                                TIPG 550
      J=N/2                                                             TIPG 560
      IF (J.EQ.0) GO TO 6508                                            TIPG 570
```

```
                    KG=N-J                                                          TIPG 580
                    00 6506 I=1,J                                                   TIPG 590
60                  IF(I.EQ.10*(I/10)+1) WRITE(6,106)                               TIPG 600
                    L=I+M-1                                                         TIPG 610
                    LK=L+KG                                                         TIPG 620
                    LK= K(LK)                                                       TIPG 630
                    L= K(L)                                                         TIPG 640
65                  I1=(L-1)/NPP+I5                                                 TIPG 650
                    I3=(LK-1  )/NPP+ I5                                             TIPG 660
                6506 WRITE(6,106)L,(NAY(L,NM),NM=1,5),I1,LK,(NAY(LK,NM),NM=1,5),I3  TIPG 670
                    IF(N.LE.2*J)GO TO 6504                                          TIPG 680
                 6568 L=J+M                                                         TIPG 690
70                  L= K(L)                                                         TIPG 700
                    I1=(L-1)/NPP+I5                                                 TIPG 710
                    WRITE(6,106)L  ,(NAY(L,NM),NM=1,5),I1                           TIPG 720
                 6504 IF(M+99-NV.LT.0) GO TO 65                                     TIPG 730
                1302 I2 = (NV-1)/NPP+I5+1                                           TIPG 740
75                  WRITE(6,104)I2                                                  TIPG 750
                    J96=55-J-J/10                                                   TIPG 760
                    DO 57 L=1,J96                                                   TIPG 770
                   57 WRITE(6,106)                                                  TIPG 780
                   65 NPG=NPG+1                                                     TIPG 790
80                  WRITE(6,102)WHEN,HOG,NPG                                        TIPG 800
                 6500 CONTINUE                                                      TIPG 810
                C-----                                                              TIPG 820
                C                                                                   TIPG 830
                    RETURN                                                          TIPG 840
85                  100 FORMAT(23H1 A COMPUTER PROGRAM OF/                          TIPG 850
                       *40H     THE CREW STATION INTEGRATION BRANCH/                TIPG 860
                       *51H     6570TH AEROSPACE MEDICAL RESEARCH LABORATORIES/     TIPG 870
                       *42H     WRIGHT-PATTERSON AIR FORCE BASE, OHIO/              TIPG 880
                       *15H          ...../                                        TIPG 890
90                     *43H          THE ANTHROPOLOGY RESEARCH PROJECT/            TIPG 900
                       *25H          WEBB ASSOCIATES/                              TIPG 910
                       *30H          YELLOW SPRINGS, OHIO)                         TIPG 920
                    101 FORMAT(15(/)/                                               TIPG 930
                       *30X,51HTHE EXTREME VALUE PROGRAM'S COMMENTS REGARDING...../ TIPG 940
95                     *20X,20A4   ,/30(/),55X,2A4)                                 TIPG 950
                    102 FORMAT(1X,2A4   ,10X,20A4,12X,4HPAGE,I4)                    TIPG 960
                    103 FORMAT(/,27H  DUPLICATE NAMES VARIABLES,I4,4H AND,I4,10H ARE NAMEDTIPG 970
                       *,2X,4A4,A2)                                                 TIPG 980
                    104 FORMAT(/36X,42HA SUMMARY OF THE STATISTICS BEGINS ON PAGE,I4) TIPG 990
100                 105 FORMAT(1H1,49X,21HTHE TABLE OF CONTENTS/       10X,         TIPG1000
                       *36H  VARIABLE NUMBER AND NAME      PAGE,30X,34HVARIABLE NUMBER ANDTIPG1010
                       * NAME      PAGE         )                                  TIPG1020
                    106 FORMAT(10X,I8,2X,4A4,A2,I8,I36,2X,4A4,A2,I8)                TIPG1030
                        END                                                         TIPG1040
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
1 TIPAGE	1	84

VARIABLES	SN	TYPE		RELOCATION							
2316	A	REAL	ARRAY	DATUMS	REFS	9					
0	HDG	REAL	ARRAY	HEAD	REFS	10	47	80			
454	I	INTEGER			REFS	27	31	33	2*35	37	39	41
					2*60	61	DEFINED	26	59		
455	ILESS1	INTEGER			REFS	28	DEFINED	27			
467	I1	INTEGER			REFS	67	72	DEFINED	65	71	
472	I2	INTEGER			REFS	75	DEFINED	74			
470	I3	INTEGER			REFS	67	DEFINED	66			
463	I5	INTEGER			REFS	65	66	71	74	DEFINED	52
456	J	INTEGER			REFS	29	37	41	57	58	59	68
					69	2*76	DEFINED	28	56		
461	JL	INTEGER			REFS	38	DEFINED	37			
473	J96	INTEGER			REFS	77	DEFINED	76			
0	K	INTEGER	ARRAY	DATUMS	REFS	15	16	29	40	63	64	70
					DEFINED	25	35	40	41		
465	KG	INTEGER			REFS	62	DEFINED	58			
462	KK	INTEGER			REFS	2*40	DEFINED	39			
457	L	INTEGER			REFS	31	2*33	62	64	65	2*67	70
					71	2*72	DEFINED	29	61	64	69	70
					77						
466	LK	INTEGER			REFS	63	66	2*67	DEFINED	62	63	
460	M	INTEGER			REFS	2*31	33	39	55	61	69	73
					DEFINED	30	33	38	53		
464	N	INTEGER			REFS	56	58	68	DEFINED	55		
315	NAY	INTEGER	ARRAY	DATUMS	REFS	9	2*31	33	2*67	72		
471	NM	INTEGER			REFS	2*67	72	DEFINED	2*67	72		
5152	NMAX	INTEGER		DATUMS	REFS	9						
24	NPG	INTEGER		HEAD	REFS	10	79	80	DEFINED	24	79	
453	NPP	INTEGER			REFS	65	66	71	74	DEFINED	23	
5153	NSUB	INTEGER		DATUMS	REFS	9						
5151	NV	INTEGER		DATUMS	REFS	9	26	52	53	55	73	74
25	WHEN	REAL	ARRAY	HEAD	REFS	10	47	80				
0	X	REAL	ARRAY	DATUMS	REFS	9	16					

FILE NAMES	MODE								
TAPE6	FMT	WRITES	33	46	47	54	60	67	72	75
		78	80							

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES
MINO	INTEGER	0	INTRIN		55

STATEMENT LABELS			DEF LINE	REFERENCES			
63	1		42	26	36		
41	2		34	28	31		
0	3		32	30	31		
0	5	INACTIVE	35				
0	6		40	38			
46	17		37	31			
0	57		78	77			
236	65		79	73			
334	100	FMT	85	46			
374	101	FMT	93	47			
406	102	FMT	96	80			
412	103	FMT	97	33			
422	104	FMT	99	75			
431	105	FMT	100	54			
446	106	FMT	103	60	67	72	78

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STATEMENT LABELS                DEF LINE   REFERENCES
    0  1302          INACTIVE      74
    0  6500                        81         53
  212  6504                        73         68
    0  6506                        67         59
  167  6508                        69         57
    0  6513          INACTIVE      55

LOOPS  LABEL    INDEX      FROM-TO    LENGTH    PROPERTIES
    6  1       * I           26 42       60B              EXT REFS  NOT INNER
   11  2       * J           28 34       33B              EXT REFS    EXITS   NOT INNER
   14  3       * M           30 32       10B        OPT     EXITS
   27          * M           33 33       11B              EXT REFS
   54  6         M           38 40        4B     INSTACK
   77  6500    * M           53 81      145B              EXT REFS  NOT INNER
  111  6506    * I           59 67       54B              EXT REFS  NOT INNER
  135          * NM          67 67       11B              EXT REFS
  150          * NM          67 67       11B              EXT REFS
  200          * NM          72 72       11B              EXT REFS
  231  57      * L           77 78        5B              EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       DATUMS     2668              0 X      (205)          205 NAM    (1025)          1230 A      (1435)
                                 2665 NV     (1)           2666 NMAX   (1)           2667 NSUB   (1)
       HEAD         23              0 HDS    (20)            20 NPG    (1)             21 WHEN   (2)

EQUIV CLASSES   LENGTH     MEMBERS - BIAS NAME(LENGTH)
X      X           205              0 K      (205)

STATISTICS
  PROGRAM LENGTH                4748     316
  CM LABELED COMMON LENGTH     52038    2691
```

100

```
      SUBROUTINE INA77                                                  INA   10
C-----                                                                  INA   20
C     INA77 INPUTS CONTROL CONSTANTS, LABELLING INFORMATION, VARIABLE   INA   30
C     NAMES, AND POSSIBLY RANGE AND CONVERSION INFORMATION FOR THE DATA. INA   40
C-----                                                                  INA   50
C THE CONTROL VARIABLES & (THEIR DEFAULT VALUES)                        INA   60
C  1.NV...THE NUMBER OF VARIABLES TO BE PROCESSED (NH)                  INA   70
C   2.NH...THE NUMBER TO BE READ IN (NV)                                INA   80
C    3.NS...THE NUMBER OF RECORDS (SUBJECTS) TO BE READ (WHETHER PROCESSINA   90
C      ED OR NOT) (77777)                                               INA  100
C     4.NT...INPUT TAPE NUMBER (5)                                      INA  110
C      5.K6...1/(FRACTION OF DATA ROUTINELY LISTED) (100)               INA  120
C       6.LN...NO. OF PHYSICALLY LAST NAME-RANGE CARD (MAX(NV,NH))      INA  130
C        7.LB...NO. OF FIRST VARIABLE TO BE CHECKED (1)                 INA  140
C         8.LT...NO. OF LAST VARIABLE TO BE CHECKED (0)                 INA  150
C          9.N1...IF.NE.0, READ IN AN INPUT FORMAT FOR THE NAME CARDS   INA  160
C            DEFAULT FORMAT...(I4,2X,4A4,A2,3F8.2,2F6.2,2F10.7)         INA  170
C           10.N2..NO. OF FORMAT CARDS FOR DATA (1)                     INA  180
C  11.NER...ACCEPTABLE NUMBER OF RECORDS WITH ONE OR MORE OUT-OF-RANGE  INA  190
C     VALUES (0)                                                        INA  200
C   12.IER...CODE FOR TREATMENT OF O-O-R VALUES (0)                     INA  210
C    13.IWHEN...IF.GT.0, READ IN DATE (0)                               INA  220
C     14.IRR..THE NUMBER OF RECORDS TO BE PROCESSED (NS)                INA  230
C-----                                                                  INA  240
C                                                                       INA  250
C.....ALL OF THESE CONTROL VALUES CAN BE SPECIFIED ON THE NAMELIST CARD INA  260
C                                                                       INA  270
C....THE INPUT FOR THIS SUBROUTINE IS THUS                              INA  280
C     1. THE NAMELIST CNTRL                                             INA  290
C      2. A CARD WITH A HEADING                                         INA  300
C       3. A CARD WITH A DATE IF IWHEN.NE.0                             INA  310
C        4. AN INPUT FORMULA FOR NAME-RANGE CARDS IF N1.NE.0            INA  320
C         5.N2 CARDS WITH THE FORMAT FOR THE DATA (N2.LE.5)             INA  330
C          6. NAME-RANGE CARDS, THE LAST ONE FOR VARIABLE LN            INA  340
C  AFTER THAT, NADA HAS AKA NOTHING                                     INA  350
C                                                                       INA  360
C                                                                       INA  370
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             INA  380
      COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   INA  390
      COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                          INA  400
      EQUIVALENCE(NL(2),NH),(NL(3),NS),(NL(4),NT),(NL(5),K6),(NL(6),LN),INA  410
     *(NL(7),LB),(NL(8),LT),(NL(9),N1),(NL(10),N2),(NL(11),NER),(NL(12),INA  420
     *IER),(NL(13),IWHEN),(NL(14),IRR),(NL(15),KEEP),(NL(16),NHDG)      INA  430
C                                                                       INA  440
      NAMELIST/CNTRL/NV,NH,NS,NT,K6,LN,LB,LT,N1,N2,NER,IER,IWHEN,IRR,   INA  450
     *NHDG                                                              INA  460
C-----                                                                  INA  470
C     IF NAMELIST IS NOT AVAILABLE, SUBSTITUTE                          INA  480
C                                                                       INA  490
C     DIMENSION IKL(15),NVL(15)                                         INA  500
C 901 READ (6,900) (IKL(L),NVL(L),L=1,15),MORE                          INA  510
C     DO 902 L=1,15                                                     INA  520
C     K=IKL(L)                                                          INA  530
C     IF(K.EQ.0)GOTO 903                                                INA  540
C 902 NL(K)=NVL(L)                                                      INA  550
C     IF(MORE.GT.0)GOTO 901                                             INA  560
C 903 IF(NL(1).NE.0)NV=NL(1)                                            INA  570
```

```
      C 900 FORMAT(15(I1,I4),I5)                                                INA  580
      C                                                                         INA  590
   60 C-----                                                                    INA  600
      C    THE NAMELIST CNTRL IS READ IN HERE                                   INA  610
      C                                                                         INA  620
            READ(5,CNTRL)                                                       INA  630
            IF(NW.EQ.0)NW=NV                                                    INA  640
   65       IF(NV.EQ.0)NV=NW                                                    INA  650
            IF(LN.EQ.0)LN=MAX0(NV,NW)                                           INA  660
            IF(IRR.EQ.0)IRR=NS                                                  INA  670
      C                                                                         INA  680
      C.....THE FOLLOWING CARD SUPRESSES CHECKING FOR XVAL AND EDIT             INA  690
   70       IF(X(1).EQ.3.14159.AND.LT.EQ.777)LT=0                               INA  700
      C                                                                         INA  710
            IF(LT.EQ.777)LT=NV                                                  INA  720
            WRITE(6,CNTRL)                                                      INA  730
            IF(NMAX.EQ.0)NMAX=NV                                                INA  740
   75 C... THE FOLLOWING IF-STATEMENT ASSURES THAT THE RELEVANT CONTROL         INA  750
      C    CONSTANTS ARE WITHIN PROGRAM LIMITATIONS                             INA  760
      C                                                                         INA  770
            IF(NV.LE.205.AND.NW.LE.205.AND.LN.LE.205.AND.NT.NE.6.AND.LT.LE.MAXINA  780
           *0(NV,NW).AND.N1.LE.1.AND.N2.LE.5.AND.IER.LE.2.AND.NV.LE.NMAX)GO TOINA  790
   80      *99                                                                 INA  800
            WRITE(6,7) NV,NMAX,NL                                               INA  810
           7 FORMAT(45H ***SOMETHING'S WRONG WITH CNTRL CONSTANTS***/,           INA  820
            *6X,5H  NV ,5H NMAX,5H *** ,5H  NW ,5H  NS ,5H  NT ,5H  K6 ,5H  LN INA  830
            *  ,5H  LB ,5H  LT ,5H  N1 ,5H  N2 ,5H  NER,5H  IER,6H IWHEN,4H IRRINA  840
   85       *,5H KEEP,5H NHDG,/,6X,18I5)                                        INA  850
            STOP                                                                INA  860
          99 CONTINUE                                                           INA  870
      C-----                                                                    INA  880
      C... THE HEADING FOR LABELLING THE OUTPUT IS READ IN HERE                 INA  890
   90 C                                                                         INA  900
            READ(5,1) HDG                                                       INA  910
            WRITE(6,1)HDG                                                       INA  920
      C                                                                         INA  930
      C... IF REQUESTED, WE READ THE DATE                                       INA  940
   95       IF(IWHEN.NE.0)READ(5,3)WHEN                                         INA  950
      C-----                                                                    INA  960
      C... NEXT COMES THE NAME-RANGE CARD AND DATA FORMATS                      INA  970
      C                                                                         INA  980
            IF(N1.NE.0)READ(5,1)F1                                              INA  990
  100       NF2=20*N2                                                           INA 1000
            READ(5,1)(F2(L),L=1,NF2)                                            INA 1010
            WRITE(6,1)F1,(F2(L),L=1,NF2)                                        INA 1020
      C-----                                                                    INA 1030
      C... LASTLY COMES THE NAME-RANGE INFORMATION                              INA 1040
  105 C                                                                         INA 1050
        100 READ(5,F1)L,(NAY(L,J),J=1,5),(A(L,J),J=1,7)                         INA 1060
            IF(L.NE.LN)GO TO 100                                                INA 1070
            DO 101 L=1,NV                                                       INA 1080
        101 WRITE(6,2)L,(NAY(L,J),J=1,5),(A(L,J),J=1,7)                         INA 1090
  110 C-----                                                                    INA 1100
            RETURN                                                              INA 1110
      C----THIS COMPLETES THE PRELIMINARY WORK                                  INA 1120
          1 FORMAT(20A4)                                                        INA 1130
          2 FORMAT(I4,2X,4A4,A2,3F10.1,2F10.2,2F10.5)                           INA 1140
```

```
    115              3 FORMAT(2A4)                                          INA 1150
                       END                                                  INA 1160
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	INA77	1	111

VARIABLES	SN	TYPE		RELOCATION						
2316	A	REAL	ARRAY	DATUMS	REFS	38	109	DEFINED	106	
0	F1	REAL	ARRAY	IN	REFS	40	102	106	DEFINED	99
24	F2	REAL	ARRAY	IN	REFS	40	102	DEFINED	101	
0	HDG	REAL	ARRAY	HEAD	REFS	39	92	DEFINED	91	
203	IER	INTEGER		IN	REFS	41	45	78		
211	INK	INTEGER		IN	REFS	40				
205	IRR	INTEGER		IN	REFS	41	45	67	DEFINED	67
210	ISUE	INTEGER		IN	REFS	40				
204	IWHEN	INTEGER		IN	REFS	41	45	95		
370	J	INTEGER			REFS	2*106	2*109	DEFINED	2*106	2*109
206	KEEP	INTEGER		IN	REFS	41				
174	K6	INTEGER		IN	REFS	41	45			
367	L	INTEGER			REFS	101	102	2*106	107	3*109
					DEFINED	101	102	106	108	
176	LB	INTEGER		IN	REFS	41	45			
175	LN	INTEGER		IN	REFS	41	45	66	78	107
					DEFINED	66				
177	LT	INTEGER		IN	REFS	41	45	70	72	78
					DEFINED	70	72			
315	NAY	INTEGER	ARRAY	DATUMS	REFS	38	109	DEFINED	106	
202	NER	INTEGER		IN	REFS	41	45			
366	NF2	INTEGER			REFS	101	102	DEFINED	100	
207	NHDG	INTEGER		IN	REFS	41	45			
170	NL	INTEGER	ARRAY	IN	REFS	40	15*41	81		
5152	NMAX	INTEGER		DATUMS	REFS	38	74	78	81	DEFINED 74
24	NPG	INTEGER		HEAD	REFS	39				
172	NS	INTEGER		IN	REFS	41	45	67		
5153	NSUB	INTEGER		DATUMS	REFS	38				
173	NT	INTEGER		IN	REFS	41	45	78		
5151	NV	INTEGER		DATUMS	REFS	38	45	64	65	66 72 74
					3*78	81	108	DEFINED	65	
171	NW	INTEGER		IN	REFS	41	45	64	65	66 2*78
					DEFINED	64				
200	N1	INTEGER		IN	REFS	41	45	78	99	
201	N2	INTEGER		IN	REFS	41	45	78	100	
25	WHEN	REAL	ARRAY	HEAD	REFS	39	DEFINED	95		
0	X	REAL	ARRAY	DATUMS	REFS	38	70			

FILE NAMES	MODE						
TAPE5	MIXED	READS	63	91	95	99	101 106
TAPE6	MIXED	WRITES	73	81	92	102	109

```
INLINE FUNCTIONS   TYPE    ARGS        DEF LINE  REFERENCES
      MAX0       INTEGER    0  INTRIN                66         78

NAMELISTS        DEF LINE     REFERENCES
      CNTRL           45         63         73

STATEMENT LABELS              DEF LINE   REFERENCES
  353  1        FMT              113         91         92         99        101        102
  355  2        FMT              114        109
  362  3        FMT              115         95
  247  7        FMT               82         81
   60  99                         87         78
  106  100                       106        107
    0  101                       109        108

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
  111          * J         106 106      11B              EXT REFS
  123          * J         106 106      11B              EXT REFS
  140  101     * L         108 109      32B              EXT REFS  NOT INNER
  143          * J         109 109      11B              EXT REFS
  155          * J         109 109      11B              EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS  NAME(LENGTH)
      DATUMS     2668                0 X       (205)          205 NAY     (1025)         1230 A       (1435)
                                  2665 NV      (1)           2666 NMAX    (1)            2667 NSUB    (1)
      HEAD         23                0 HDG     (20)            20 NPG     (1)              21 WHEN    (2)
      IN          138                0 F1      (20)            20 F2      (100)           120 NL      (16)
                                   136 ISUE    (1)            137 INK     (1)

EQUIV CLASSES   LENGTH     MEMBERS - BIAS  NAME(LENGTH)
F1    NL           16                1 NW      (1)             2 NS      (1)              3 NT      (1)
                                     4 K6      (1)             5 LN      (1)              6 LB      (1)
                                     7 LT      (1)             8 N1      (1)              9 N2      (1)
                                    10 NER     (1)            11 IER     (1)             12 IWHEN   (1)
                                    13 IRR     (1)            14 KEEP    (1)             15 NHOG    (1)

STATISTICS
  PROGRAM LENGTH                 371B      249
  CM LABELED COMMON LENGTH      5415B     2829
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```
      SUBROUTINE IN877                                                  IN8   10
C-----                                                                  IN8   20
C     IN877 IS OUR DATA INPUT AND ALTERATION ROUTINE.  IT BRINGS IN DATA IN8   30
C     OF THE FORM-- NSUB,(X(I),I=1,NW) --FOR EACH SUBJECT, ROUTINELY    IN8   40
C     CALLS SUBROUTINE NUNU99 FOR POSSIBLE DATA ALTERATIONS, PRINTS OUT IN8   50
C     DATA FOR A SPECIFIED FRACTION OF THE SUBJECTS, AND, IF REQUESTED, IN8   60
C     CHECKS TO SEE THAT THE DATA ARE IN THE SPECIFIED RANGE.           IN8   70
C                                                                       IN8   80
C-----                                                                  IN8   90
      COMMON/DATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB             IN8  100
      COMMON/HEAD/HOG(20),NPG,WHEN(2)                                   IN8  110
      COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                          IN8  120
      EQUIVALENCE(NL(2),NW),(NL(3),NS),(NL(4),NT),(NL(5),K6),(NL(6),LN),IN8  130
     *(NL(7),L8),(NL(8),LT),(NL(9),N1),(NL(10),N2),(NL(11),NER),(NL(12),IN8  140
     *IER),(NL(13),IWHEN),(NL(14),IRR),(NL(15),KEEP),(NL(16),NHOG)      IN8  150
C-----                                                                  IN8  160
      MX=-1                                                             IN8  170
C... WE CHECK HERE TO SEE IF THE REQUESTED AMOUNT OF DATA HAS BEEN READ IN8  180
C     IN YET                                                            IN8  190
C                                                                       IN8  200
      IF (INK.NE.IRR.AND.ISUE.NE.NS) GOTO200                            IN8  210
      WRITE( 6,6) NS,IRR                                                IN8  220
    6 FORMAT(46H THE INPUT ENDS WITH, AS REQUESTED EITHER THE, I5,      IN8  230
     121HTH RECORD READ OR THE, I5,19HTH RECORD PROCESSED)              IN8  240
C-----                                                                  IN8  250
C... ALL THE DATA IS IN.  WE LET XVAL KNOW BY SETTING NSUB=-13, THEN    IN8  260
C     RETURN CONTROL TO XVAL FOR FINAL PROCESSING                       IN8  270
C                                                                       IN8  280
      NSUB=-13                                                          IN8  290
      RETURN                                                            IN8  300
C-----                                                                  IN8  310
  200 ISUE=ISUE+1                                                       IN8  320
C... THE SUBJECT DATA IS READ IN HERE                                   IN8  330
C                                                                       IN8  340
      READ(NT,F2)NSUB,(X(I),I=1,NW)                                     IN8  350
C                                                                       IN8  360
C... A CHECK FOR THE END OF THE DATA                                    IN8  370
      IF(NSUB.LE.0)GOTO201                                              IN8  380
      IF(EOF(NT))201,202                                                IN8  390
  201 NSUB=-13                                                          IN8  400
      WRITE(6,50)NSUB,INK,ISUE                                          IN8  410
  500FORMAT(63H ***DATA INPUT COMPLETED WITH READING OF RECORD FOR SUBJIN8  420
     1ECT NO.,I5,14H. THIS WAS THE, I5,19HTH RECORD USED, THE,I5,14HTH RIN8  430
     2ECORD READ )                                                      IN8  440
      RETURN                                                            IN8  450
  202 CONTINUE                                                          IN8  460
C-----                                                                  IN8  470
C     **********      WE CALL NUNU99      **********                    IN8  480
C                                                                       IN8  490
      CALL NUNU99 (KEEP)                                                IN8  500
C                                                                       IN8  510
C... IF KEEP WAS SET TO SOMETHING OTHER THAN 1492 IN NUNU99, THE CURRENTIN8  520
C     SUBJECT IS REJECTED AND WE GO BACK UP TO READ THE NEXT            IN8  530
      IF (KEEP.NE.1492) GO TO 200                                       IN8  540
C-----                                                                  IN8  550
      INK=INK+1                                                         IN8  560
C-----                                                                  IN8  570
```

```
                C... WE PRINT OUT THE FIRST TEN SUBJECTS DATA PLUS DATA FOR EVERY K6TH  INB  580
                C    SUBJECT                                                          INB  590
          60    C                                                                     INB  600
                      IF(INK.LE.10.OR.INK.EQ.K6*(INK/K6))                           INB  610
                     *WRITE(6,110)INK,NSUB,(X(L),L=1,NV)                            INB  620
                      MSUB=NSUB                                                     INB  630
                C                                                                   INB  640
          65          IF (LT.EQ.0) RETURN                                           INB  650
                C-----                                                              INB  660
                C... IF REQUESTED, THE DATA ARE NOW CHECKED FOR OUT OF RANGE VALUES FOR INB  670
                C    VARIABLES LB TO LT                                             INB  680
                C                                                                   INB  690
          70          DO 111 L=LB,LT                                                INB  700
                      IF(X(L).GE.A(L,1).AND.X(L).LE.A(L,2))GO TO 111                INB  710
                      IF (X(L).EQ.0.0) GO TO 111                                    INB  720
                      WRITE(6,112)NSUB,L,X(L),A(L,1),A(L,2)                         INB  730
                C                                                                   INB  740
          75    C*IF FIRST ERROR FOR THIS SUBJECT, REDUCE NER BY 1                  INB  750
                      IF (NSUB.NE.MX) NER=NER-1                                     INB  760
                      IF (NER.LT.0) GO TO 999                                       INB  770
                C     IF AN OUTOF RANGE VALUE IS OBSERVED, ONE OF THREE THINGS CAN  INB  790
                C                   HAPPEN...                                       INB  800
          80    C        IF  IER=0, THE RECORD IS REJECTED AND A NEW ONE READ       INB  810
                C        IF  IER=1, THE VALUE IN QUESTION IS SET EQUAL TO ZERO      INB  820
                C        IF  IER>1, THE VALUE IS SET EQUAL TO THE APPROXIMATE MEAN  INB  830
                C                                                                   INB  840
                      IF (IER.NE.0) GO TO 101                                       INB  850
          85          INK=INK-1                                                     INB  860
                      GO TO 200                                                     INB  870
                  101 CONTINUE                                                      INB  880
                      X(L)=0.0                                                      INB  890
                      IF (IER.GT.1) X(L)=A(L,3)                                     INB  900
          90          MX=NSUB                                                       INB  910
                  111 CONTINUE                                                      INB  920
                C-----                                                              INB  930
                      RETURN                                                        INB  940
                C                                                                   INB  950
          95      999 WRITE(6,998)                                                  INB  960
                      STOP                                                          INB  970
                  110 FORMAT(7H NREC =,I5,8H  NSUB =,I5,/,(20F6.0))                 INB  980
                  112 FORMAT(6H NSUB=,I4,4H  X(,I3,2H)=,F10.2,5X,5H MIN=,F6.1,2X,5HMAX=,INB  990
                     *F6.1)                                                         INB 1000
         100      998 FORMAT(//6H **** ,48HALLOWABLE NUMBER OF OUT-OF-RANGE VALUES EXCEEINB 1010
                     *DED)                                                          INB 1020
                      END                                                           INB 1030
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES			
1	INB77	1	30	45	65	93

VARIABLES	SN	TYPE		RELOCATION							
2316	A	REAL	ARRAY	DATUMS	REFS	10	2*71	2*73	89		
0	F1	REAL	ARRAY	IN	REFS	12					
24	F2	REAL	ARRAY	IN	REFS	12	35				
0	HDG	REAL	ARRAY	HEAD	REFS	11					
246	I	INTEGER			REFS	35	DEFINED	35			
203	IER	INTEGER		IN	REFS	13	84	89			
211	INK	INTEGER		IN	REFS	12	21	41	56	4*61	85
					DEFINED	56	85				
205	IRR	INTEGER		IN	REFS	13	21	22			
210	ISUE	INTEGER		IN	REFS	12	21	32	41	DEFINED	32
204	IWHEN	INTEGER		IN	REFS	13					
206	KEEP	INTEGER		IN	REFS	13	50	54			
174	K6	INTEGER		IN	REFS	13	2*61				
250	L	INTEGER			REFS	61	4*71	72	4*73	88	2*89
					DEFINED	61	70				
176	LB	INTEGER		IN	REFS	13	70				
175	LN	INTEGER		IN	REFS	13					
177	LT	INTEGER		IN	REFS	13	65	70			
247	MSUB	INTEGER			REFS	41	DEFINED	63			
245	MX	INTEGER			REFS	76	DEFINED	17	90		
315	NAY	INTEGER	ARRAY	DATUMS	REFS	10					
202	NER	INTEGER		IN	REFS	13	76	77	DEFINED	76	
207	NHOG	INTEGER		IN	REFS	13					
170	NL	INTEGER	ARRAY	IN	REFS	12	15*13				
5152	NMAX	INTEGER		DATUMS	REFS	10					
24	NPG	INTEGER		HEAD	REFS	11					
172	NS	INTEGER		IN	REFS	13	21	22			
5153	NSUB	INTEGER		DATUMS	REFS	10	38	61	63	73	76 90
					DEFINED	29	35	40			
173	NT	INTEGER		IN	REFS	13	39	I/O REFS	35		
5151	NV	INTEGER		DATUMS	REFS	10	61				
171	NW	INTEGER		IN	REFS	13	35				
200	N1	INTEGER		IN	REFS	13					
201	N2	INTEGER		IN	REFS	13					
25	WHEN	REAL	ARRAY	HEAD	REFS	11					
0	X	REAL	ARRAY	DATUMS	REFS	10	61	2*71	72	73	
					DEFINED	35	88	89			

FILE NAMES	MODE				
TAPE6	FMT	WRITES	22	41	61 73 95
VARIABLES USED AS FILE NAMES, SEE ABOVE					

EXTERNALS	TYPE	ARGS	REFERENCES
EOF	REAL	1	39
NUNU99		1	50

STATEMENT LABELS			DEF LINE	REFERENCES		
130	6	FMT	23	22		
160	50	FMT	42	41		
102	101		87	84		
220	110	FMT	97	61		
111	111		91	70	71	72
225	112	FMT	98	73		
14	200		32	21	54	86
27	201		40	38	39	
33	202		46	39		
234	998	FMT	100	95		

STATEMENT LABELS

	DEF LINE	REFERENCES
114 999	95	77

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES	EXT REFS	EXITS
56	111	*	L	70 91	368			

COMMON BLOCKS

	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)						
DATUMS	2668	0	X	(205)	205	NAY	(1025)	1230	A	(1435)
		2665	NV	(1)	2666	NMAX	(1)	2667	NSUB	(1)
HEAD	23	0	HDG	(20)	20	NPG	(1)	21	WHEN	(2)
IN	138	0	F1	(20)	20	F2	(100)	120	NL	(16)
		136	ISUE	(1)	137	INK	(1)			

EQUIV CLASSES

		LENGTH	MEMBERS - BIAS	NAME	(LENGTH)					
F1	NL	16	1	NW	(1)	2	NS	(1)	3	NT	(1)
			4	K6	(1)	5	LN	(1)	6	LB	(1)
			7	LT	(1)	8	N1	(1)	9	N2	(1)
			10	NER	(1)	11	IER	(1)	12	IWHEN	(1)
			13	IRR	(1)	14	KEEP	(1)	15	NHDG	(1)

STATISTICS

PROGRAM LENGTH	2518	169
CM LABELED COMMON LENGTH	54158	2829

```
      1              SUBROUTINE NUNJ99 (KEEP)                                  NUNU  10
                   C-----                                                      NUNU  20
                   C... THIS SUBROUTINE'S FUNCTION IS FOR MAKING CHANGES IN THE OATA.  IT  NUNU  30
                   C    ROUTINELY OOES NOTHING EXCEPT RETURN CONTROL TO IN877.  IT IS IN  NUNU  40
      5            C    THIS ROUTINE THAT WE FABRICATE NEW VARIABLES, AFTER THE REGULAR  NUNU  50
                   C    VARIABLES, OR ELIMINATE OATA RECORDS BY INSERTING SECTIONS OF    NUNU  60
                   C    PROGRAM COOE.                                            NUNU  70
                   C                                                             NUNU  80
                   C-----                                                        NUNU  90
     10            C... WHEN MAKING AN XVAL RUN, THIS ROUTINE SHOULO ALWAYS BE CHECKEO TO  NUNU 100
                   C    INSURE NO UNWANTEO OATA CHANGES FROM A PREVIOUS RUN REMAIN.  NUNU 110
                   C-----                                                        NUNU 120
                   C                                                             NUNU 130
                        COMMON/OATUMS/X(205),NAY(205,5),A(205,7),NV,NMAX,NSUB    NUNU 140
     15            C-----                                                        NUNU 150
                   C.....IF KEEP .NE.1492, THE RECORO JUST REAO IS IGNOREO       NUNU 160
                   C                                                             NUNU 170
                        KEEP=1492                                                NUNU 180
                        RETURN                                                   NUNU 190
     20                 ENO                                                      NUNU 200
```


SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS

3	NUNU99	1

DEF LINE: 19

VARIABLES

		SN	TYPE		RELOCATION				
2316	A		REAL	ARRAY	OATUMS	REFS	14		
0	KEEP		INTEGER		F.P.	OEFINEO	1	18	
315	NAY		INTEGER	ARRAY	OATUMS	REFS	14		
5152	NMAX		INTEGER		OATUMS	REFS	14		
5153	NSUB		INTEGER		OATUMS	REFS	14		
5151	NV		INTEGER		OATUMS	REFS	14		
0	X		REAL	ARRAY	OATUMS	REFS	14		

COMMON BLOCKS

	LENGTH	MEMBERS - BIAS	NAME(LENGTH)						
OATUMS	2668	0	X	(205)	205	NAY	(1025)	1230	A (1435)
		2665	NV	(1)	2666	NMAX	(1)	2667	NSUB (1)

STATISTICS

PROGRAM LENGTH	78	7
CM LABELEO COMMON LENGTH	51548	2668

APPENDIX B

COMPUTER PRINTOUT OF THE EDIT PROGRAM

```
      PROGRAM EDIT76                                                    EDIT  10
     +(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE21,TAPE9,PUNCH)        EDIT  20
C $$$$$$$$$$$$$$$$$$$$$$$$$$$$$                                         EDIT  30
C     FIRST CHECK SUBROUTINE NUNU99 FOR GARBAGE FROM A PAST RUN }}}     EDIT  40
C $$$$$$$$$$$$$$$$$$$$$$$$$$$$$                                         EDIT  50
C    TAPE 9 IS THE INPUT TAPE FROM PF'S)                                EDIT  60
C    TAPE 21 IS A SCRATCH TAPE                                          EDIT  70
C                                                                       EDIT  80
C-I                                                                     EDIT  90
C                                                                       EDIT 100
C---- COMMON DATUMS IS SET UP FOR 125 VERIABLES. ARRAYS X, NAME, AND A  EDIT 110
C      SHOULD BE DIMENSIONED THE SAME.                                  EDIT 120
      COMMON/DATUMS/X(125),NAY (125,5),A(125,7),NV,NMAX,NSUB            EDIT 130
      EQUIVALENCE(AVG,A(1,1)),(SD,A(1,2)),(ZN,A(1,3))                   EDIT 140
C     THE ARRAY, A(125,7) IS NOT USED. THE EQUIVALENCE STATEMENT        EDIT 150
C     LETS US USE SOME OF THE SPACE SET ASIDE FOR A.                    EDIT 160
C     X(I) IS THE I'TH DATA VALUE, THE NAME FOR THE I'TH VARIABLE IS    EDIT 170
C     STORED IN NAY(I,1) THRU NAY(I,5), NV IS THE NUMBER OF VARIABLES,  EDIT 180
C     NMAX IS NOT USED, NSUB IS THE SUBJECT NUMBER                      EDIT 190
C---- COMMON COMP IS SET UP FOR 100 COMBINATIONS, IF A DIFFERENT        EDIT 200
C      NUMBER OF COMBINATIONS IS WANTED CHANGE, JOB, S, SS AND CSQ.     EDIT 210
C       ALSO CHANGE THE VALUE OF MAXCOM.                                EDIT 220
      COMMON/COMP/JOB(4,100),S(10,100),SS(10,100),CSQ(15,100)           EDIT 230
     +,LIST(20,18),CK,NCOM,NLISTS,NPRINT                                EDIT 240
C     THE ARRAY JOB STORES THE COMBINATIONS, ARRAY S STORES THE         EDIT 250
C     SUMATIONS OF X,Y,Z,X**2,Y**2,Z**2,XY,XZ,YZ,N,ARRAY SS IS USED     EDIT 260
C     FOR CHANGING THE SUMATIONS FROM ARRAY S WHEN WE FIND ABBERANT     EDIT 270
C     VALUES, CSQ STORES THE REGRESSION EQUATIONS, THE STANDARD ERRORS  EDIT 280
C     OF ESTIMATE, AND THE MULTIPLE CORRELATIONS, ARRAY LIST STORES     EDIT 290
C     THE LISTS, CK IS THE CHECK VALUE, NCOM IS THE NUMBER OF           EDIT 300
C     COMBINATIONS, NLIST IS THE NUMBER OF LISTS                        EDIT 310
C     NPRINT CONTROLS SOME OF THE OUTPUT                                EDIT 320
C     IF MORE THAN 20 LISTS ARE WANTED CHANGE                           EDIT 330
C     THE FIRST DIMENSION FOR LIST                                      EDIT 340
      DIMENSION IX(24),SK(10),AVG(1),SD(1),ZN(1),SCORE(21)              EDIT 350
      NAMELIST/ED/CK,NREP,NEQ,NTOTAL,NPUNCH,NPRINT,NCV                  EDIT 360
C     NCV IS THE NUMBER OF CALCULATED VARIABLES                         EDIT 370
C     HERE WE SET UP THE INITIAL VALUES                                 EDIT 380
      DATA CK,NREP,NEQ,NTOTAL,NPUNCH,NPRINT,NCV/                        EDIT 390
     *3.5,2,9999,9999,0,0,0/                                            EDIT 400
      DATA QX,QY,QZ/1HX,1HY,1HZ/                                        EDIT 410
      DATA MAXCOM/100/                                                  EDIT 420
      DATA NLISTS,NCOM,JACK/0,0,0/                                      EDIT 430
C---- CHANGE THIS DATA STATEMENT TO REFLECT ANY CHANGE                  EDIT 440
C      IN THE DIMENSION OF ARRAYS S AND A.                              EDIT 450
      DATA S,A /1875*0.0/                                               EDIT 460
C     THIS STATMENT PREVENTS US FROM TAKING THE SQUAREROOT OF A NEGITIVEEDIT 470
C     NUMBER                                                            EDIT 480
      SQROOT(Z)=SQRT(AMAX1(Z,.00001))                                   EDIT 490
      X(1) = 3.14159                                                    EDIT 500
      REWIND 21                                                         EDIT 510
C                                                                       EDIT 520
C-II                                                                    EDIT 530
C                                                                       EDIT 540
C----THE DATA STREAM BEGINS WITH THE NAMELIST/ED/ FOLLOWED BY THE       EDIT 550
C    COMBINATION + LIST CARDS. THESE CARDS CAN BE INTERMIXED + MUST     EDIT 560
C    BE FOLLOWED BY A BLANK CARD                                        EDIT 570
```

```
      C     READ THE NAME LIST                                                EDIT 580
            READ (5,ED)                                                       EDIT 590
   60       WRITE(6,ED)                                                       EDIT 600
            IF(NEQ.GT.NTOTAL) NEQ=NTOTAL                                      EDIT 610
            IF(NEQ.EQ.NTOTAL.AND.NREP.EQ.-1) GOTO 998                         EDIT 620
      C     THIS LOOP READS THE COMBINATION AND LIST CARDS                    EDIT 630
          2 READ 1,AA,IX                                                      EDIT 640
   65     1 FORMAT(A4,24I3)                                                   EDIT 650
            IF(AA.EQ.4H    )GOTO10                                            EDIT 660
            IF(AA.EQ.4HCOMB)GOTO 3                                            EDIT 670
            IF(AA.NE.4HLIST)GOTO 999                                          EDIT 680
      C     HERE WE HANDEL THE LIST CARDS                                     EDIT 690
   70       L=IX(1)                                                           EDIT 700
            IF(L.LT.1.OR.L.GT.20)GOTO 999                                     EDIT 710
            NLISTS=MAX0(L,NLISTS)                                             EDIT 720
            DO 4 J=1,18                                                       EDIT 730
          4 LIST(L,J)=IX(J+1)                                                 EDIT 740
   75       GOTO 2                                                            EDIT 750
      C     HERE WE HANDEL THE COMBINATION CATOS                              EDIT 760
          3 DO 5 L=1,21,4                                                     EDIT 770
            IF(IX(L).EQ.0)GOTO 5                                              EDIT 780
            NCOM=NCOM+1                                                       EDIT 790
   80       IF(NCOM.GT.MAXCOM)GOTO 999                                        EDIT 800
            DO 6 J=1,4                                                        EDIT 810
            M=L+J-1                                                           EDIT 820
          6 JOB(J,NCOM)=IX(M)                                                 EDIT 830
          5 CONTINUE                                                          EDIT 840
   85       GO TO 2                                                           EDIT 850
         10 CONTINUE                                                          EDIT 860
     C----WE NOW HAVE THE COMBINATIONS + LISTS READ IN + STORED               EDIT 870
     C     NTOTAL DOES NOT NEED TO BE CHANGED UNLESS THERE ARE TEN THOUSAND    EDIT 880
     C     OR MORE SUBJECTS IN WHICH CASE IT SHOULD BE SET GREATER THAN THE    EDIT 890
   90 C     TOTAL NUMBER OF SUBJECTS                                          EDIT 900
     C     NEQ IF YOU WANT TO USE THE DATA WHICH YOU HAVE ALL READY EDITED     EDIT 910
     C     TO BASE YOUR EQUISIONS ON SET NEQ TO THE NUMBER OF GOOD RECORDS     EDIT 920
           PRINT 11,NEQ,NTOTAL,NREP,CK,NCOM,NLISTS                            EDIT 930
        11 FORMAT(  *1THE PROGRAM PARAMETERS----*/                            EDIT 940
   95     1* NEQ, THE NUMBER OF RECORDS IN THE EQUATIONS =*,I5/               EDIT 950
          2* NTOTAL, THE TOTAL NUMBER OF RECORDS =*,I12/                      EDIT 960
          3* NREP, THE NUMBER OF REPETITIONS =*,I16/                          EDIT 970
          4* CK, THE CHECK VALUE =*,F28.2/                                    EDIT 980
          5* NCOM, THE NUMBER OF COMBINATIONS =*,I15/                         EDIT 990
  100     6* NLISTS, THE NUMBER OF LISTS =*,I20)                              EDIT1000
          PRINT 12,((L,(JOB(J,L),J=1,4),L=1,NCOM)                             EDIT1010
        12 FORMAT(//* THE COMBINATIONS----*/(4(I 6,1H.,I4,1H-,I4,1H-,I4,      EDIT1020
         +2H (,I4,1H))))                                                      EDIT1030
          PRINT 13,(L,(LIST(L,J),J=1,18),L=1,NLISTS)                          EDIT1040
  105     13 FORMAT(//* THE LISTS---*/(2H  ,I2,5X,17(I3,1H,),I3.3))          EDIT1050
     C                                                                        EDIT1060
     C-III                                                                    EDIT1070
     C                                                                        EDIT1080
     C---- CHECK THE COMMON CARDS                                            EDIT1090
  110       CALL INA77                                                        EDIT1100
     C     FROM INA WE GET NAY,NV,HOG                                        EDIT1110
     C                                                                        EDIT1120
     C-IV                                                                     EDIT1130
     C                                                                        EDIT1140
```

```
      C     NOW WE ARE READY TO MAKE SOME CALCULATIONS                        EOIT1150
      C     IN LOOP #100 WE SUM, THE INDIVIDUAL VARIABLES THEIR SQUARES,      EOIT1160
      C     AND THE CROSS PRODUCTS FOR EACH COMBINATION                       EOIT1170
            NCV = NV + NCV                                                    EOIT1180
            DO 7 I = 1,3                                                      EOIT1190
            DO 7 J = 1,NCV                                                    EOIT1200
          7 A(J,I) = 0.0                                                      EOIT1210
            DO 100 IJK=1,NEQ                                                  EOIT1220
      C     WE GO THROUGH THE LOOP ONCE FOR EACH SUBJECT                      EOIT1230
      C---- CHECK THE COMMON CARDS                                            EOIT1240
            CALL INB77                                                        EOIT1250
      C     FROM INB WE GET NSUB AND X.                                       EOIT1260
            IF(NSUB.LE.0)GOTO105                                              EOIT1270
            JACK=JACK+1                                                       EOIT1280
            WRITE(21) NSUB,(X(I),I=1,NCV)                                     EOIT1290
            DO 100 L=1,NCOM                                                   EOIT1300
      C     WE GO THROUGH THE LOOP ONCE FOR EACH COMBINATION                  EOIT1310
            K=JOB(1,L) $ I=JOB(2,L) $ M=JOB(3,L)                              EOIT1320
            W=X(K) $ Y=X(I) $ Z=X(M)                                          EOIT1330
            IF(W*Y*Z.EQ.0.0)GOTO 100                                          EOIT1340
            S(1,L)=S(1,L) +W                                                  EOIT1350
            S(2,L)=S(2,L) +Y                                                  EOIT1360
            S(3,L)=S(3,L) +Z                                                  EOIT1370
            S(4,L)=S(4,L) +W**2                                               EOIT1380
            S(5,L)=S(5,L) +Y**2                                               EOIT1390
            S(6,L)=S(6,L) +Z**2                                               EOIT1400
            S(7,L)=S(7,L) +W*Y                                                EOIT1410
            S(8,L)=S(8,L) +W*Z                                                EOIT1420
            S(9,L)=S(9,L) +Y*Z                                                EOIT1430
            S(10,L)=S(10,L) +1.0                                              EOIT1440
        100 CONTINUE                                                          EOIT1450
            IF(NEQ.EQ.NTOTAL)GOTO 102                                         EOIT1460
      C---- IF NEQ, THE NUMBER OF RECORDS IN THE EQUATIONS,                   EOIT1470
      C     IS LESS THAN NTOTAL, THE TOTAL NUMBER OF RECORDS,                 EOIT1480
      C     WE READ IN THE REST OF THE DATA RECORDS.                          EOIT1490
            K=NEQ+1                                                           EOIT1500
            DO 103 IJK=K,NTOTAL                                               EOIT1510
            CALL INB77                                                        EOIT1520
            IF(NSUB.LE.0)GOTO 102                                             EOIT1530
            JACK=JACK+1                                                       EOIT1540
        103 WRITE (21) NSUB,(X(I),I=1,NCV)                                    EOIT1550
        102 NTOTAL=JACK                                                       EOIT1560
        105 IF(NSUB.LE.0)NEQ=JACK                                             EOIT1570
            ENDFILE 21                                                        EOIT1580
            REWIND 21                                                         EOIT1590
      C----THE SUMMATIONS S(I,J) ARE NEVER MODIFIED. AT THE                   EOIT1600
      C    BEGINNING OF EACH ITERATION, THEIR VALUES ARE MOVED TO            EOIT1610
      C    THE ARRAY SS(I,J) WHICH MAY BE MODIFIED BY                        EOIT1620
      C    REMOVING VALUES RELATING TO AAV'S.                                EOIT1630
            DO 199 I=1,10                                                     EOIT1640
            DO 199IK=1,NCOM                                                   EOIT1650
        199 SS(I,IK) = S(I,IK)                                                EOIT1660
         99 DO 200 J=1,NCOM                                                   EOIT1670
            KK=JOB(1,J) $ LL=JOB(2,J) $ MM=JOB(3,J)                           EOIT1680
            ZZ=SS(10,J)+0.000001                                              EOIT1690
            DO 201 L=1,9                                                      EOIT1700
        201 SK(L)=SS(L,J)/ZZ                                                  EOIT1710
```

```
                AVGX=SK(1) $ AVGY=SK(2) $ AVGZ=SK(3)                                EDIT1720
                SDX=SQRDDT(SK(4)-AVGX**2)                                           EDIT1730
                SDY=SQRDDT(SK(5)-AVGY**2)                                           EDIT1740
175             SDZ=SQRDDT(SK(6)-AVGZ**2)                                           EDIT1750
                R12= (SK(7)-AVGX*AVGY)/(SDX*SDY)                                    EDIT1760
                R13= (SK(8)-AVGX*AVGZ)/(SDX*SDZ)                                    EDIT1770
                R23=(SK(9)-AVGY*AVGZ)/(SDY*SDZ)                                     EDIT1780
                BXY=(R12-R13*R23)/(1.0-R23**2)                                      EDIT1790
180             BXZ=(R13-R12*R23)/(1.0-R23**2)                                      EDIT1800
                BYX=(R12-R13*R23)/(1.0-R13**2)                                      EDIT1810
                BYZ=(R23-R12*R13)/(1.0-R13**2)                                      EDIT1820
                BZX=(R13-R12*R23)/(1.0-R12**2)                                      EDIT1830
                BZY=(R23-R12*R13)/(1.0-R12**2)                                      EDIT1840
185             CSQ(1,J)=BXY*SDX/SDY                                                EDIT1850
                CSQ(2,J)=BXZ*SDX/SDZ                                                EDIT1860
                CSQ(3,J)=AVGX-CSQ(1,J)*AVGY-CSQ(2,J)*AVGZ                           EDIT1870
                CSQ(4,J)=BYX*SDY/SDX                                                EDIT1880
                CSQ(5,J)=BYZ*SDY/SDZ                                                EDIT1890
190             CSQ(6,J)=AVGY-CSQ(4,J)*AVGX-CSQ(5,J)*AVGZ                           EDIT1900
                CSQ(7,J)=BZX*SDZ/SDX                                                EDIT1910
                CSQ(8,J)=BZY*SDZ/SDY                                                EDIT1920
                CSQ(9,J)=AVGZ-CSQ(7,J)*AVGX-CSQ(8,J)*AVGY                           EDIT1930
                CSQ(10,J)=AMIN1(0.999,R12*BXY+R13*BXZ)                              EDIT1940
195             CSQ(11,J)=AMIN1(0.999,R12*BYX+R23*BYZ)                              EDIT1950
                CSQ(12,J)=AMIN1(0.999,R13*BZX+R23*BZY)                              EDIT1960
                CSQ(13,J)=SDX*SQRDDT(1.0-CSQ(10,J))                                 EDIT1970
                CSQ(14,J)=SDY*SQRDDT(1.0-CSQ(11,J))                                 EDIT1980
                CSQ(15,J)=SDZ*SQRDDT(1.0-CSQ(12,J))                                 EDIT1990
200             CSQ(10,J)=SQRT(CSQ(10,J))                                           EDIT2000
                CSQ(11,J)=SQRT(CSQ(11,J))                                           EDIT2010
                CSQ(12,J)=SQRT(CSQ(12,J))                                           EDIT2020
                IF(NPRINT.LT.1) GO TO 202                                           EDIT2030
                PRINT 211,J,KK,LL,MM,(NAY (KK,I),I=1,5),                            EDIT2040
205            1(NAY (LL,I),I=1,5),(NAY (MM,I),I=1,5),                              EDIT2050
               +AVGX,AVGY,AVGZ,SDX,SDY,SDZ,                                         EDIT2060
               2QX,CSQ(1,J),QY,CSQ(2,J),QZ,CSQ(3,J),CSQ(13,J),CSQ(10,J),            EDIT2070
               3QY,CSQ(4,J),QX,CSQ(5,J),QZ,CSQ(6,J),CSQ(14,J),CSQ(11,J),            EDIT2080
               4QZ,CSQ(7,J),QX,CSQ(8,J),QY,CSQ(9,J),CSQ(15,J),CSQ(12,J),            EDIT2090
210            5R12,R13,R23,SS(10,J)                                                EDIT2100
           211 FORMAT(39H SUMMARY STATISTICS FOR COMBINATION NO.,I4,                 EDIT2110
               120X,1H(,I3,1H,I3,1H,I3,1H)//                                        EDIT2120
               25H X = ,4A4,A2,10X,4HY = ,4A4,A2,10X,4HZ = ,4A4,A2/                 EDIT2130
               31X,3(17H THE MEAN VALUE = ,F10.2,6X)/                               EDIT2140
215            41X,3(17H ST'D DEVIATION = ,F10.2,6X)/                               EDIT2150
               53(2X,A1,4H = (,F10.3,1H),A1,5H, + (,F10.3,1H),A1,3H + ,             EDIT2160
               6F10.3,3X,5HSE = ,F8.3,23H MULTIPLE CORR. COEF. =,F5.3/)             EDIT2170
               7/10X,28H SIMPLE CORRELATIONS-R(XY) =,F6.3,9H, R(XZ) =,              EDIT2180
               8F6.3,9H, R(YZ) =,F6.3,10X,3HN =,F6.0)                               EDIT2190
220            202 IF(NREP.GT.1)GOTO200                                             EDIT2200
                   IF(ZN(KK).GE.SS(10,J))GOTO251                                    EDIT2210
                   AVG(KK)=AVGX $ SD(KK)=SDX $ ZN(KK)=SS(10,J)                      EDIT2220
               251 IF(ZN(LL).GE.SS(10,J))GOTO252                                    EDIT2230
                   AVG(LL)=AVGY $ SD(LL)=SDY $ ZN(LL)=SS(10,J)                      EDIT2240
225            252 IF(ZN(MM).GE.SS(10,J))GOTO253                                    EDIT2250
                   AVG(MM)=AVGZ $ SD(MM)=SDZ $ ZN(MM)=SS(10,J)                      EDIT2260
               253 CONTINUE                                                         EDIT2270
               200 CONTINUE                                                         EDIT2280
```

```
                    IF(NREP.LT.2)GO TO 287                                  EDIT2290
230                 DO 226 I=1,10                                           EDIT2300
                    DO 226IK=1,NCOM                                         EDIT2310
                226 SS(I,IK) = S(I,IK)                                      EDIT2320
                    CALL COMPAR(NREP,NEQ)                                   EDIT2330
                    NREP=NREP-1                                             EDIT2340
235                 REWIND 21                                               EDIT2350
                    GO TO 99                                                EDIT2360
                287 CONTINUE                                                EDIT2370
                    DO 213 J=1,NCV                                          EDIT2380
                    IF(SD(J).EQ.0.001) GO TO 213                            EDIT2390
240                 DO 214 M=1,21                                           EDIT2400
                    XM=M-11                                                 EDIT2410
                214 SCORE(M)=AVG(J)+XM*SD(J)/2.0                            EDIT2420
                    PRINT 212,J,(NAY (J,I),I=1,5),AVG(J),SD(J),ZN(J),SCORE  EDIT2430
                213 CONTINUE                                                EDIT2440
245             212 FORMAT(/10X,12X,12HVARIABLE NO.,I4,10X,4A4,A2,10X,6HMEAN =,  EDIT2450
                   1F8.2,10X,11HSTD. DEV. =,F7.2,3H N=,F6.0/                EDIT2460
                   248H -5 SD  -4.5 -4 SD  -3.5 -3 SD  -2.5 -2 SD  -1.5     EDIT2470
                   348H - 1SD  -0.5  MEAN  +0.5 +1 SD  +1.5 +2 SD  +2.5     EDIT2480
                   430H +3 SD  +3.5 +4 SD  +4.5 +5 SD/21F6.0)               EDIT2490
250                 IF(NPUNCH.NE.0)PUNCH 215,J,(NAY (J,I),I=1,5),AVG(J),SD(J)  EDIT2500
                215 FORMAT(I3,2X,4A4,A2,2F10.2)                             EDIT2510
                    IF(NREP.EQ.1)GOTO 302                                   EDIT2520
                    DO 303 L=1,NEQ                                          EDIT2530
                303 READ(21)NSUB                                            EDIT2540
255                 JACK=JACK-NEQ                                           EDIT2550
                302 CALL COMPAR(1,JACK)                                     EDIT2560
                    STOP                                                    EDIT2570
                999 PRINT 899,AA,IX                                         EDIT2580
                899 FORMAT(* SOMETHING IS WRONG WITH THIS COMBO-LIST CARD :*/  EDIT2590
260                +25X,A4,24I3)                                            EDIT2600
                    STOP                                                    EDIT2610
                998 PRINT 898                                               EDIT2620
                898 FORMAT(* SOMETHING IS WRONG*)                           EDIT2630
                    STOP                                                    EDIT2640
265                 END                                                     EDIT2650
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS

		DEF LINE	REFERENCES
12257	EDIT76	1	

VARIABLES

		SN	TYPE		RELOCATION								
1356	A		REAL	ARRAY	DATUMS	REFS	13	3*14	DEFINED	46	121		
13715	AA		REAL			REFS	66	67	68	258	DEFINED	64	
1356	AVG		REAL	ARRAY	DATUMS	REFS	14	35	242	243	250		
						DEFINED	222	224	226				
13734	AVGX		REAL			REFS	173	176	177	187	190	193	204
						222	DEFINED	172					
13735	AVGY		REAL			REFS	174	176	178	187	190	193	204
						224	DEFINED	172					
13736	AVGZ		REAL			REFS	175	177	178	187	190	193	204

VARIABLES	SN	TYPE	RELOCATION		
13745	BXY	REAL			
13746	BXZ	REAL			
13747	BYX	REAL			
13750	BYZ	REAL			
13751	BZX	REAL			
13752	BZY	REAL			
10244	CK	REAL		COMP	
4540	CSQ	REAL	ARRAY	COMP	
13721	I	INTEGER			
13722	IJK	INTEGER			
13727	IK	INTEGER			
13754	IX	INTEGER	ARRAY		
13717	J	INTEGER			
13302	JACK	INTEGER			
0	JDB	INTEGER	ARRAY	COMP	
13723	K	INTEGER			
13730	KK	INTEGER			
13716	L	INTEGER			
7474	LIST	INTEGER	ARRAY	COMP	
13731	LL	INTEGER			
13720	M	INTEGER			
13301	MAXCOM	INTEGER			
13732	MM	INTEGER			
175	NAY	INTEGER	ARRAY	DATUMS	
10245	NCOM	INTEGER		COMP	
13275	NCV	INTEGER			
13272	NEQ	INTEGER			
10246	NLISTS	INTEGER		COMP	
3132	NMAX	INTEGER		DATUMS	
10247	NPRINT	INTEGER		COMP	
13274	NPUNCH	INTEGER			
13271	NREP	INTEGER			
3133	NSUB	INTEGER		DATUMS	
13273	NTOTAL	INTEGER			

226	DEFINED	172					
REFS	185	194	DEFINED	179			
REFS	186	194	DEFINED	180			
REFS	188	195	DEFINED	181			
REFS	189	195	DEFINED	182			
REFS	191	196	DEFINED	183			
REFS	192	196	DEFINED	184			
REFS	23	36	93	DEFINED	39		
REFS	23	2*187	2*190	2*193	197	198	199
200	201	202	15*204	DEFINED	185	186	187
188	189	190	191	192	193	194	195
196	197	198	199	200	201	202	
REFS	121	129	133	155	2*166	3*204	2*232
243	250	DEFINED	119	129	132	155	164
3*204	230	243	250				
DEFINED	122	151					
REFS	2*166	2*232	DEFINED	165	231		
REFS	35	70	74	78	83	258	
DEFINED	64						
REFS	2*74	82	83	101	104	121	3*168
169	171	185	186	3*187	188	189	3*190
191	192	3*193	194	195	196	2*197	2*198
2*199	2*200	2*201	2*202	17*204	221	222	223
224	225	226	239	2*242	5*243	4*250	
DEFINED	73	81	101	104	120	167	238
REFS	128	154	156	157	255	256	
DEFINED	43	128	154	255			
REFS	23	101	3*132	3*168	DEFINED	83	
REFS	133	151	DEFINED	132	150		
REFS	2*204	221	3*222	DEFINED	168		
REFS	2*71	72	74	78	82	2*101	2*104
3*132	2*135	2*136	2*137	2*138	2*139	2*140	2*141
2*142	2*143	2*144	2*171	DEFINED	70	77	101
104	130	170	253				
REFS	23	104	DEFINED	74			
REFS	2*204	223	3*224	DEFINED	168		
REFS	83	133	241	242	DEFINED	82	132
240							
REFS	80	DEFINED	42				
REFS	2*204	225	3*226	DEFINED	168		
REFS	13	3*204	243	250			
REFS	23	79	80	83	93	101	130
165	167	231	DEFINED	43	79		
REFS	36	118	120	129	155	238	
DEFINED	39	118					
REFS	36	61	62	93	122	146	150
233	253	255	DEFINED	39	61	157	
REFS	23	72	93	104	DEFINED	43	72
REFS	13						
REFS	23	36	203	DEFINED	39		
REFS	36	250	DEFINED	39			
REFS	36	62	93	220	229	233	234
252	DEFINED	39	234				
REFS	13	127	129	153	155	157	
DEFINED	254						
REFS	36	2*61	62	93	146	151	
DEFINED	39	156					

VARIABLES	SN	TYPE	RELOCATION							
3131	NV	INTEGER	DATUMS	REFS	13	118				
13276	QX	REAL		REFS	3*204	DEFINED	41			
13277	QY	REAL		REFS	3*204	DEFINED	41			
13300	QZ	REAL		REFS	3*204	DEFINED	41			
13742	R12	REAL		REFS	179	180	181	182	2*183	2*184	194
				195	204	DEFINED	176				
13743	R13	REAL		REFS	179	180	2*181	2*182	183	184	194
				196	204	DEFINED	177				
13744	R23	REAL		REFS	2*179	2*180	181	182	183	184	195
				196	204	DEFINED	178				
620	S	REAL	ARRAY COMP	REFS	23	135	136	137	138	139	140
				141	142	143	144	166	232		
				DEFINED	46	135	136	137	138	139	140
				141	142	143	144				
14016	SCORE	REAL	ARRAY	REFS	35	243	DEFINED	242			
1553	SD	REAL	ARRAY DATUMS	REFS	14	35	239	242	243	250	
				DEFINED	222	224	226				
13737	SDX	REAL		REFS	176	177	185	186	188	191	197
				204	222	DEFINED	173				
13740	SDY	REAL		REFS	176	178	185	188	189	192	198
				204	224	DEFINED	174				
13741	SDZ	REAL		REFS	177	178	186	189	191	192	199
				204	226	DEFINED	175				
14004	SK	REAL	ARRAY	REFS	35	3*172	173	174	175	176	177
				178	DEFINED	171					
2570	SS	REAL	ARRAY COMP	REFS	23	169	171	204	221	222	223
				224	225	226	DEFINED	166	232		
13724	W	REAL		REFS	134	135	138	141	142		
				DEFINED	133						
0	X	REAL	ARRAY DATUMS	REFS	13	129	3*133	155	DEFINED	50	
13753	XM	REAL		REFS	242	DEFINED	241				
13725	Y	REAL		REFS	134	136	139	141	143		
				DEFINED	133						
13726	Z	REAL		REFS	134	137	140	142	143		
				DEFINED	133						
1750	ZN	REAL	ARRAY DATUMS	REFS	14	35	221	223	225	243	
				DEFINED	222	224	226				
13733	ZZ	REAL		REFS	171	DEFINED	169				

FILE NAMES		MODE								
0	INPUT	FMT	READS	64						
2041	OUTPUT	FMT	WRITES	93	101	104	204	243	258	262
10204	PUNCH	FMT	WRITES	250						
4102	TAPE21	UNFMT	WRITES	129	155	READS	254	MOTION	51	158	159
			235							
0	TAPE5	NAME	READS	59						
2041	TAPE6	NAME	WRITES	60						
6143	TAPE9									

EXTERNALS	TYPE	ARGS	REFERENCES							
COMPAR		2	233	256						
INA77		0	110							
INB77		0	125	152						
SQRT	REAL	1 LIBRARY	173	174	175	197	198	199	200	201	202

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES					
AMAX1	REAL	0	INTRIN		173	174	175	197	198	199
AMIN1	REAL	0	INTRIN		194	195	196			
MAX0	INTEGER	0	INTRIN		72					
SQROOT	REAL	1	SF	49	173	174	175	197	198	199

NAMELISTS	DEF LINE	REFERENCES	
ED	36	59	60

STATEMENT LABELS			DEF LINE	REFERENCES		
13321	1	FMT	65	64		
12277	2		64	75	85	
12324	3		77	67		
0	4		74	73		
12344	5		84	77	78	
0	6		83	81		
0	7		121	119	120	
12347	10		86	66		
13334	11	FMT	94	93		
13401	12	FMT	102	101		
13421	13	FMT	105	104		
12551	99		167	236		
12475	100		145	122	130	134
12523	102		156	146	153	
0	103		155	151		
12525	105		157	127		
0	199		166	164	165	
13101	200		228	167	220	
0	201		171	170		
13047	202		220	203		
13521	211	FMT	211	204		
13604	212	FMT	245	243		
13172	213		244	238	239	
0	214		242	240		
13645	215	FMT	251	250		
0	226		232	230	231	
13061	251		223	221		
13071	252		225	223		
13101	253		227	225		
13130	287		237	229		
13227	302		256	252		
0	303		254	253		
13674	898	FMT	263	262		
13661	899	FMT	259	258		
13235	998		262	62		
13232	999		258	68	71	80

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
12320	4		J	73 74	38	INSTACK
12325	5	*	L	77 84	228	EXITS NOT INNER
12337	6		J	81 83	48	INSTACK
12354		*	L	101 101	118	EXT REFS
12371		*	L	104 104	158	EXT REFS NOT INNER
12373		*	J	104 104	118	EXT REFS
12413	7	*	I	119 121	128	NOT INNER
12420	7		J	120 121	28	INSTACK
12426	100	*	IJK	122 145	548	EXT REFS EXITS NOT INNER
12447	100		L	130 145	308	OPT

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES		
12506	103	*	IJK	151 155	15B		EXT REFS	EXITS
12535	199	*	I	164 166	14B		NOT INNER	
12542	199		IK	165 166	3B	INSTACK		
12552	200	*	J	167 228	332B		EXT REFS	NOT INNER
12567	201		L	170 171	3B	INSTACK		
12757		*	I	204 204	11B		EXT REFS	
12771		*	I	204 204	11B		EXT REFS	
13003		*	I	204 204	11B		EXT REFS	
13107	226	*	I	230 232	14B		NOT INNER	
13114	226		IK	231 232	3B	INSTACK		
13131	213	*	J	238 244	44B		EXT REFS	NOT INNER
13142	214		M	240 242	6B	INSTACK		
13153		*	I	243 243	11B		EXT REFS	
13200		*	I	250 250	11B		EXT REFS	
13221	303	*	L	253 254	5B		EXT REFS	

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)						
DATUMS	1628	0	X	(125)	125	NAY	(625)	750	A	(875)
		1625	NV	(1)	1626	NMAX	(1)	1627	NSUB	(1)
COMP	4264	0	JOB	(400)	400	S	(1000)	1400	SS	(1000)
		2400	CSQ	(1500)	3900	LIST	(360)	4260	CK	(1)
		4261	NCOM	(1)	4262	NLISTS	(1)	4263	NPRINT	(1)

EQUIV	CLASSES	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)					
X	A	875	0	AVG	(1)	125	SD	(1)	250	ZN	(1)

STATISTICS

PROGRAM LENGTH	15758	893
BUFFER LENGTH	122468	5286
CM LABELED COMMON LENGTH	13404B	5892

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      BLOCK DATA BLKDAT.    74/74   OPT=1                          FTN 4.5+414        02/01/78  14.24.15       PAGE      1

     1                BLOCK DATA                                                          DATA  10
                      COMMON/HEAD/HDG(20),NPG,WHEN(2)                                     DATA  20
                      COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                            DATA  30
                      DATA ISUE,INK,WHEN/-1,0,2*4H    /                                   DATA  40
     5                DATA NL/2*0,77777,5,100,0,1,777,0,1,4*0,1492,0/                     DATA  50
                      DATA F1/4H (I4,4H,2X,,4H4A4,,4HA2,3,4HF8.2,4H,2F6,4H.2,2,4HF10.,2HDATA  60
                     *7),11*1H /                                                          DATA  70
                      END                                                                 DATA  80
```

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      SYMBOLIC REFERENCE MAP (R=3)

VARIABLES     SN  TYPE          RELOCATION
    0  F1        REAL       ARRAY    IN          REFS        3    DEFINED       6
   24  F2        REAL       ARRAY    IN          REFS        3
    0  HDG       REAL       ARRAY    HEAD        REFS        2
  211  INK       INTEGER               IN          REFS        3    DEFINED       4
  210  ISUE      INTEGER               IN          REFS        3    DEFINED       4
  170  NL        INTEGER    ARRAY    IN          REFS        3    DEFINED       5
   24  NPG       INTEGER               HEAD        REFS        2
   25  WHEN      REAL       ARRAY    HEAD        REFS        2    DEFINED       4

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
      HEAD         23                0 HDG    (20)          20 NPG    (1)          21 WHEN   (2)
      IN          138               0 F1     (20)          20 F2     (100)       120 NL     (16)
                                  136 ISUE   (1)           137 INK    (1)

STATISTICS
  PROGRAM LENGTH                  0B       0
  CM LABELED COMMON LENGTH      241B     161
```

```
      SUBROUTINE COMPAR(NREP,NTEST)                                      COMP  10
      COMMON/DATUMS/X(125),NAV (125,5),A(125,7),NV,NMAX,NSUB             COMP  20
      COMMON/COMP/JOB(4,100),S(10,100),SS(10,100),CSQ(15,100)            COMP  30
     +,LIST(20,18),CK,NCOM,NLISTS,NPRINT                                 COMP  40
      DIMENSION AVG(1),SO(1),ZN(1)                                       COMP  50
      DIMENSION  NOMA(18,5),IZ(18),Z1(18),Z2(18),Z3(18)                  COMP  60
      EQUIVALENCE(AVG,A(1,1)),(SO,A(1,2)),(ZN,A(1,3))                    COMP  70
      INTEGER SUSVAR(125),SUSLST(20)                                     COMP  80
      PRINT 99,NREP,NTEST                                                COMP  90
   99 FORMAT( 1H1////* COMPAR CALLED WITH NREP =*,I5,* + NTEST =,*,I6)   COMP 100
      DO 1 I=1,NV                                                        COMP 110
    1 SUSVAR(I)=0                                                        COMP 120
      DO 2 I=1,20                                                        COMP 130
    2 SUSLST(I)=0                                                        COMP 140
      NAAV=0                                                             COMP 150
C     LOOP #5 CONTAINS ALL OF THE COMPUTATION FOR COMPAR WE GO THROUGH    COMP 160
C     LOOP #5 ONCE FOR EACH SUBJECT                                      COMP 170
      DO 5 KLM=1,NTEST                                                   COMP 180
      READ(21)NSUB,(X(I),I=1,NV)                                         COMP 190
      IF(NSUB.LE.0)GOTO 200                                              COMP 200
C     WE GO THROUGH LOOP #10 FOR EACH COMBINATION ONCE PER SUBJECT       COMP 210
      DO 10 J=1,NCOM                                                     COMP 220
      KK=JOB(1,J) $ LL=JOB(2,J) $ MM=JOB(3,J)                           COMP 230
      W=X(KK)     $ Y=X(LL)     $  Z=X(MM)                             COMP 240
      IF(W*Y*Z.EQ.0.0)GOTO 10                                            COMP 250
C----WE READ IN A DATA RECORD FROM THE SCRATCH TAPE                      COMP 260
C----FOR EACH COMBINATION, WE DESIGNATE THE THREE VARIABLES AS W,Y,Z     COMP 270
C    USING THE CONSTANTS CALCULATED BY THE MAIN PROGRAM--CSQ--WE         COMP 280
C    CALCULATE THE REGRESSION VALUES (CALX,CALY,CALZ), THE DIFFERENCES   COMP 290
C    BETWEEN THE CALCULATED & RECORDED VALUES DIVIDED BY THE STANDARD    COMP 300
C    ERRORS OF ESTIMATE (DELX,DELY,DELZ) & THEIR ABSOLUTE VALUES (AOX,   COMP 310
C    ADY,ADZ)                                                            COMP 320
      CALX=CSQ(1,J)*Y + CSQ(2,J)*Z + CSQ(3,J)                            COMP 330
      CALY=CSQ(4,J)*W + CSQ(5,J)*Z + CSQ(6,J)                            COMP 340
      CALZ=CSQ(7,J)*W + CSQ(8,J)*Y + CSQ(9,J)                            COMP 350
      DELX=(W-CALX)/CSQ(13,J)                                            COMP 360
      DELY=(Y-CALY)/CSQ(14,J)                                            COMP 370
      DELZ=(Z-CALZ)/CSQ(15,J)                                            COMP 380
      AOX=ABS(DELX)                                                      COMP 390
      ADY=ABS(DELY)                                                      COMP 400
      ADZ=ABS(DELZ)                                                      COMP 410
      ADW=AMAX1(ADX,AOY,AOZ)                                             COMP 420
C----IF AOW, THE BIGGEST OF THE DISCREPENCIES, IS LESS THAN CK, THIS     COMP 430
C    SUBJECT HAS PASSED ON THIS COMBINATION                              COMP 440
      IF(AOW.LT.CK)GOTO 10                                               COMP 450
C----ONCE WE FIND THE FIRST APPARENTLY ABBERANT VALUE FOR A SUBJECT, WE  COMP 460
C    PRINT OUT THE SUBJECT NUMBER & SET NAAV=NSUB.                       COMP 470
      IF(NPRINT.LT.1.AND.NREP.GT.1)    GO TO 9                           COMP 480
      IF(NAAV.NE.NSUB) PRINT 100,NSUB                                    COMP 490
  100 FORMAT(//* SUBJECT*I6)                                             COMP 500
      NAAV=NSUB                                                          COMP 510
C----AND WE PRINT OUT AN ERROR MESSAGE--                                 COMP 520
      PRINT 101,KK,(NAV (KK,L),L=1,5),W,CALX,DELX,LL,(NAV (LL,L),L=1,5),COMP 530
     +Y,CALY,DELY,MM,(NAV (MM,L),L=1,5),Z,CALZ,DELZ                      COMP 540
  101 FORMAT  (4H NO.,I3,1X,4A4,A2,2F6.0,F6.1,2(4H ** ,I3,1X,4A4,A2,     COMP 550
     +2F6.0,F6.1))                                                       COMP 560
    9 IF (NREP.GT.1) GOTO11                                              COMP 570
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      C----IF THIS IS THE FINAL ITERATION, WE RECORD THE VARIABLE(S) WITH AAV COMP 580
      C    'S FOR THE 'LIST' PRINT OUTS                                      COMP 590
   60       IF(ADX.GT.CK)SUSVAR(KK)=NSUB                                     COMP 600
            IF(AOY.GT.CK)SUSVAR(LL)=NSUB                                     COMP 610
            IF(AOZ.GT.CK)SUSVAR(MM)=NSUB                                     COMP 620
            K=JOB(4,J)                                                       COMP 630
            SUSLST(K)=NSUB                                                   COMP 640
   65       GO TO 10                                                         COMP 650
      C----IF THIS SUBJECT IS IN THE REGRESSION EQUATION SERIES, WE DELETE THECOMP 660
      C    AAV'S FROM THE SUMMATIONS                                         COMP 670
         11 SS(1,J)=SS(1,J)-W                                                COMP 680
            SS(2,J)=SS(2,J)-Y                                                COMP 690
   70       SS(3,J)=SS(3,J)-Z                                                COMP 700
            SS(4,J)=SS(4,J)-W**2                                             COMP 710
            SS(5,J)=SS(5,J)-Y**2                                             COMP 720
            SS(6,J)=SS(6,J)-Z**2                                             COMP 730
            SS(7,J)=SS(7,J)-W*Y                                              COMP 740
   75       SS(8,J)=SS(8,J)-W*Z                                              COMP 750
            SS(9,J)=SS(9,J)-Y*Z                                              COMP 760
            SS(10,J)=SS(10,J)-1.0                                            COMP 770
         10 CONTINUE                                                         COMP 780
      C----IF THIS IS THE LAST ITERATION, THE LIST-LISTINGS ARE MADE         COMP 790
   80       IF(NREP.GT.1) GOTO 5                                             COMP 800
            IF(NAAV.NE.NSUB) GOTO 5                                          COMP 810
            DO 20 J=1,NLISTS                                                 COMP 820
      C----IF THE J'TH LIST WAS INVOLVED IN ANY COMBINATION WITH A AAV, THE  COMP 830
      C    VALUE OF ABLIST WAS SET TO NSUB                                   COMP 840
   85       IF(SUSLST(J).NE.NSUB)GOTO 20                                     COMP 850
            K=0                                                              COMP 860
            DO 21 I=1,18                                                     COMP 870
      C----FOR EACH VARIABLE ON THE LIST, WE ASSEMBLE ITS NUMBER (IZ), NAME  COMP 880
      C    (NOMA), ACTUAL VALUE (Z1), + STANDARD SCORE VALUE (Z2)            COMP 890
   90       L1=LIST(J,I)                                                     COMP 900
            IF(L1.EQ.0)GOTO22                                                COMP 910
            K=K+1                                                            COMP 920
            DO 3 N = 1,5                                                     COMP 930
          3 NOMA(K,N) = NAY(L1,N)                                            COMP 940
   95       IZ(K)=L1                                                         COMP 950
            Z1(K)=X(L1)                                                      COMP 960
         21 Z2(K)=(X(L1)-AVG(L1))/SO(L1)                                     COMP 970
         22 CONTINUE                                                         COMP 980
            DO 30 LT=1,K,9                                                   COMP 990
  100       J1=MIN0(LT+8,K)                                                  COMP1000
            PRINT 31,(IZ(M),NOMA(M,1),NOMA(M,2),M = LT,J1)                   COMP1010
            PRINT 32,(NOMA(M,3),NOMA(M,4),NOMA(M,5),M = LT,J1)               COMP1020
            PRINT 33,(Z1(M),Z2(M),M=LT,J1)                                   COMP1030
         31 FORMAT(14X,9(I4,1X,2A4))                                         COMP1040
  105    32 FORMAT(14X,9(3X,2A4,A2))                                         COMP1050
         33 FORMAT(14X,9(F7.1,F6.2))                                         COMP1060
      C----WE NEED TO KNOW WHICH VARIABLES ON THIS LIST HAS AAV'S            COMP1070
            DO 25 I=1,K                                                      COMP1080
            L1=LIST(J,I)                                                     COMP1090
  110       IF(SUSVAR(L1).NE.NSUB)GOTO25                                     COMP1100
            DO 35 KK=LT,J1                                                   COMP1110
         35 Z3(KK)=Z2(KK)*SO(L1)+AVG(L1)                                     COMP1120
         34 PRINT 36, (NAY(L1,N),N=1,5)     ,(Z3(KK),KK=LT,J1)               COMP1130
         25 CONTINUE                                                         COMP1140
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                30 CONTINUE                                                          COMP1150
                20 CONTINUE                                                          COMP1160
                 5 CONTINUE                                                          COMP1170
                36 FORMAT(2X,4A4,A2,F8.2,8F13.2)                                     COMP1180
               200 CONTINUE                                                          COMP1190
                   PRINT 98                                                          COMP1200
                98 FORMAT(////* COMPAR FINISHED. CONTROL RETURNED TO MAIN PROGRAM*)  COMP1210
                   RETURN                                                            COMP1220
                   END                                                               COMP1230
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS

		DEF LINE	REFERENCES
3	COMPAR	1	122

VARIABLES

		SN	TYPE		RELOCATION							
1356	A		REAL	ARRAY	DATUMS	REFS	2	3*7				
646	AOW		REAL			REFS	45	DEFINED	42			
643	AOX		REAL			REFS	42	60	DEFINED	39		
644	AOY		REAL			REFS	42	61	DEFINED	40		
645	AOZ		REAL			REFS	42	62	DEFINED	41		
1356	AVG		REAL	ARRAY	DATUMS	REFS	5	7	97	112		
635	CALX		REAL			REFS	36	53	DEFINED	33		
636	CALY		REAL			REFS	37	53	DEFINED	34		
637	CALZ		REAL			REFS	38	53	DEFINED	35		
10244	CK		REAL		COMP	REFS	3	45	60	61	62	
4540	CSQ		REAL	ARRAY	COMP	REFS	3	3*33	3*34	3*35	36	37	38
640	DELX		REAL			REFS	39	53	DEFINED	36		
641	DELY		REAL			REFS	40	53	DEFINED	37		
642	DELZ		REAL			REFS	41	53	DEFINED	38		
623	I		INTEGER			REFS	12	14	19	90	109	
						DEFINED	11	13	19	87	108	
1010	IZ		INTEGER	ARRAY		REFS	6	101	DEFINED	95		
626	J		INTEGER			REFS	3*23	3*33	3*34	3*35	36	37	38
							63	2*68	2*69	2*70	2*71	2*72	2*73	2*74
							2*75	2*76	2*77	85	90	109		
						DEFINED	22	82						
0	JDB		INTEGER	ARRAY	COMP	REFS	3	3*23	63					
654	J1		INTEGER			REFS	101	102	103	111	113			
						DEFINED	100							
650	K		INTEGER			REFS	64	92	94	95	96	97	99	
							100	108	DEFINED	63	86	92		
627	KK		INTEGER			REFS	24	2*53	60	2*112	113			
						DEFINED	23	111	113					
625	KLM	*	INTEGER			DEFINED	18							
647	L		INTEGER			REFS	3*53	DEFINED	3*53					
7474	LIST		INTEGER	ARRAY	COMP	REFS	3	90	109					
630	LL		INTEGER			REFS	24	2*53	61	DEFINED	23			
653	LT		INTEGER			REFS	100	101	102	103	111	113		
						DEFINED	99							
651	L1		INTEGER			REFS	91	94	95	96	3*97	110	2*112	
							113	DEFINED	90	109				
655	M		INTEGER			REFS	3*101	3*102	2*103	DEFINED	101	102	103	

VARIABLES	SN	TYPE		RELOCATION								
631	MM	INTEGER			REFS	24	2*53	62	DEFINED	23		
652	N	INTEGER			REFS	2*94	113	DEFINED	93	113		
624	NAAV	INTEGER			REFS	49	81	DEFINED	15	51		
175	NAY	INTEGER	ARRAY	DATUMS	REFS	2	3*53	94	113			
10245	NCOM	INTEGER		COMP	REFS	3	22					
10246	NLISTS	INTEGER		COMP	REFS	3	82					
3132	NMAX	INTEGER		DATUMS	REFS	2						
656	NOMA	INTEGER	ARRAY		REFS	6	2*101	3*102	DEFINED	94		
10247	NPRINT	INTEGER		COMP	REFS	3	48					
0	NREP	INTEGER		F.P.	REFS	9	48	57	80	DEFINED	1	
3133	NSUB	INTEGER		DATUMS	REFS	2	20	2*49	51	60	61	62
						64	81	85	110	DEFINED	19	
0	NTEST	INTEGER		F.P.	REFS	9	18	DEFINED	1			
3131	NV	INTEGER		DATUMS	REFS	2	11	19				
620	S	REAL	ARRAY	COMP	REFS	3						
1553	SD	REAL	ARRAY	DATUMS	REFS	5	7	97	112			
2570	SS	REAL	ARRAY	COMP	REFS	3	68	69	70	71	72	73
						74	75	76	77	DEFINED	68	69	70
						71	72	73	74	75	76	77
1315	SUSLST	INTEGER	ARRAY		REFS	8	85	DEFINED	14	64		
1120	SUSVAR	INTEGER	ARRAY		REFS	8	110	DEFINED	12	60	61	62
632	W	REAL			REFS	25	34	35	36	53	68	71
						74	75	DEFINED	24			
0	X	REAL	ARRAY	DATUMS	REFS	2	3*24	96	97	DEFINED	19	
633	Y	REAL			REFS	25	33	35	37	53	69	72
						74	76	DEFINED	24			
634	Z	REAL			REFS	25	33	34	38	53	70	73
						75	76	DEFINED	24			
1750	ZN	REAL	ARRAY	DATUMS	REFS	5	7					
1032	Z1	REAL	ARRAY		REFS	6	103	DEFINED	96			
1054	Z2	REAL	ARRAY		REFS	6	103	112	DEFINED	97		
1076	Z3	REAL	ARRAY		REFS	6	113	DEFINED	112			

FILE NAMES	MODE								
OUTPUT	FMT	WRITES	9	49	53	101	102	103	113	120
TAPE21	UNFMT	READS	19							

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES		
ABS	REAL	1	INTRIN	39	40	41	
AMAX1	REAL	0	INTRIN	42			
MIN0	INTEGER	0	INTRIN	100			

STATEMENT LABELS			DEF LINE	REFERENCES			
0	1		12	11			
0	2		14	13			
0	3		94	93			
435	5		117	18	80	81	
166	9		57	48			
235	10		78	22	25	45	65
210	11		68	57			
432	20		116	82	85		
0	21		97	87			
302	22		98	91			
425	25		114	108	110		
0	30		115	99			
564	31	FMT	104	101			
567	32	FMT	105	102			

STATEMENT LABELS OEF LINE REFERENCES

572	33	FMT	106	103
0	34	INACTIVE	113	
0	35		112	111
604	36	FMT	118	113
613	98	FMT	121	120
452	99	FMT	10	9
472	100	FMT	50	49
525	101	FMT	55	53
440	200		119	20

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
22	1		I	11 12	28	INSTACK
30	2		I	13 14	28	INSTACK
35	5	*	KLM	18 117	4038	EXT REFS EXITS NOT INNER
45	10	*	J	22 78	1738	EXT REFS NOT INNER
126		*	L	53 53	118	EXT REFS
141		*	L	53 53	118	EXT REFS
154		*	L	53 53	118	EXT REFS
244	20	*	J	82 116	1718	EXT REFS NOT INNER
251	21	*	I	87 97	318	EXITS NOT INNER
265	3		N	93 94	38	INSTACK
303	30	*	LT	99 115	1278	EXT REFS NOT INNER
312		*	M	101 101	128	EXT REFS
331		*	M	102 102	128	EXT REFS
350		*	M	103 103	108	EXT REFS
362	25	*	I	108 114	468	EXT REFS NOT INNER
376	35		KK	111 112	48	INSTACK
406		*	N	113 113	118	EXT REFS

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)							
DATUMS	1628	0	X	(125)	125	NAY	(625)	750	A	(875)	
		1625	NV	(1)	1626	NMAX	(1)	1627	NSUB	(1)	
COMP	4264	0	JOB	(400)	400	S	(1000)	1400	SS	(1000)	
		2400	CSQ	(1500)	3900	LIST	(360)	4260	CK	(1)	
		4261	NCOM	(1)	4262	NLISTS	(1)	4253	NPRINT	(1)	

EQUIV	CLASSES	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)						
X	A	875	0	AVG	(1)	125	SD	(1)	250	ZN	(1)

STATISTICS

PROGRAM LENGTH	13478	743
CM LABELED COMMON LENGTH	134048	5892

```
      SUBROUTINE INA77                                                  INA   10
C-----                                                                  INA   20
C     INA77 INPUTS CONTROL CONSTANTS, LABELLING INFORMATION, VARIABLE   INA   30
C     NAMES, AND POSSIBLY RANGE AND CONVERSION INFORMATION FOR THE DATA. INA  40
C-----                                                                  INA   50
C THE CONTROL VARIABLES & (THEIR DEFAULT VALUES)                        INA   60
C  1.NV...THE NUMBER OF VARIABLES TO BE PROCESSED (NW)                  INA   70
C   2.NW...THE NUMBER TO BE READ IN (NV)                                INA   80
C    3.NS...THE NUMBER OF RECORDS (SUBJECTS) TO BE READ (WHETHER PROCESSINA  90
C      ED OR NOT) (77777)                                               INA  100
C     4.NT...INPUT TAPE NUMBER (5)                                      INA  110
C      5.K6...1/(FRACTION OF DATA ROUTINELY LISTED) (100)               INA  120
C       6.LN...NO. OF PHYSICALLY LAST NAME-RANGE CARD (MAX(NV,NW))      INA  130
C        7.LB...NO. OF FIRST VARIABLE TO BE CHECKED (1)                 INA  140
C         8.LT...NO. OF LAST VARIABLE TO BE CHECKED (0)                 INA  150
C          9.N1...IF.NE.0, READ IN AN INPUT FORMAT FOR THE NAME CARDS   INA  160
C            DEFAULT FORMAT...(I4,2X,4A4,A2,3F8.2,2F6.2,2F10.7)         INA  170
C           10.N2..NO. OF FORMAT CARDS FOR DATA (1)                     INA  180
C  11.NER...ACCEPTABLE NUMBER OF RECORDS WITH ONE OR MORE OUT-OF-RANGE   INA  190
C     VALUES (0)                                                        INA  200
C   12.IER...CODE FOR TREATMENT OF O-O-R VALUES (0)                     INA  210
C    13.IWHEN...IF.GT.0, READ IN DATE (0)                               INA  220
C     14.IRR..THE NUMBER OF RECORDS TO BE PROCESSED (NS)                INA  230
C-----                                                                  INA  240
C                                                                       INA  250
C.....ALL OF THESE CONTROL VALUES CAN BE SPECIFIED ON THE NAMELIST CARD INA  260
C                                                                       INA  270
C....THE INPUT FOR THIS SUBROUTINE IS THUS                              INA  280
C     1. THE NAMELIST CNTRL                                             INA  290
C      2. A CARD WITH A HEADING                                         INA  300
C       3. A CARD WITH A DATE IF IWHEN.NE.0                             INA  310
C        4. AN INPUT FORMULA FOR NAME-RANGE CARDS IF N1.NE.0            INA  320
C         5.N2 CARDS WITH THE FORMAT FOR THE DATA (N2.LE.5)             INA  330
C          6. NAME-RANGE CARDS, THE LAST ONE FOR VARIABLE LN            INA  340
C  AFTER THAT, NADA WAS AKA NOTHING                                     INA  350
C                                                                       INA  360
C                                                                       INA  370
      COMMON/DATUMS/X(125),NAM (125,5),A(125,7),NV,NMAX,NSUB            INA  380
      COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   INA  390
      COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                          INA  400
      EQUIVALENCE(NL(2),NW),(NL(3),NS),(NL(4),NT),(NL(5),K6),(NL(6),LN),INA  410
     *(NL(7),LB),(NL(8),LT),(NL(9),N1),(NL(10),N2),(NL(11),NER),(NL(12),INA  420
     *IER),(NL(13),IWHEN),(NL(14),IRR),(NL(15),KEEP),(NL(16),NHDG)      INA  430
C                                                                       INA  440
      NAMELIST/CNTRL/NV,NW,NS,NT,K6,LN,LB,LT,N1,N2,NER,IER,IWHEN,IRR,   INA  450
     *NHDG                                                              INA  460
C-----                                                                  INA  470
C     IF NAMELIST IS NOT AVAILABLE, SUBSTITUTE                          INA  480
C                                                                       INA  490
C     DIMENSION IKL(15),NVL(15)                                         INA  500
C 901 READ (6,900) (IKL(L),NVL(L),L=1,15),MORE                          INA  510
C     DO 902 L=1,15                                                     INA  520
C     K=IKL(L)                                                          INA  530
C     IF(K.EQ.0)GOTO 903                                                INA  540
C 902 NL(K)=NVL(L)                                                      INA  550
C     IF(MORE.GT.0)GOTO 901                                             INA  560
C 903 IF(NL(1).NE.0)NV=NL(1)                                            INA  570
```

```
      C 900 FORMAT(15(I1,I4),I5)                                                INA  580
      C                                                                         INA  590
   60 C-----                                                                    INA  600
      C     THE NAMELIST CNTRL IS READ IN HERE                                  INA  610
      C                                                                         INA  620
            READ(5,CNTRL)                                                       INA  630
            IF(NW.EQ.0)NW=NV                                                    INA  640
   65       IF(NV.EQ.0)NV=NW                                                    INA  650
            IF(LN.EQ.0)LN=MAX0(NV,NW)                                           INA  660
            IF(IRR.EQ.0)IRR=NS                                                  INA  670
      C                                                                         INA  680
      C.....THE FOLLOWING CARD SUPRESSES CHECKING FOR XVAL AND EDIT             INA  690
   70       IF(X(1).EQ.3.14159.AND.LT.EQ.777)LT=0                               INA  700
      C                                                                         INA  710
            IF(LT.EQ.777)LT=NV                                                  INA  720
            WRITE(6,CNTRL)                                                      INA  730
            IF(NMAX.EQ.0)NMAX=NV                                                INA  740
   75 C... THE FOLLOWING IF-STATEMENT ASSURES THAT THE RELEVANT CONTROL         INA  750
      C     CONSTANTS ARE WITHIN PROGRAM LIMITATIONS                            INA  760
      C                                                                         INA  770
            IF(NV.LE.205.AND.NW.LE.205.AND.LN.LE.205.AND.NT.NE.6.AND.LT.LE.MAXINA  780
           *0(NV,NW).AND.N1.LE.1.AND.N2.LE.5.AND.IER.LE.2.AND.NV.LE.NMAX)GO TOINA  790
   80      *99                                                                 INA  800
            WRITE(6,7) NV,NMAX,NL                                               INA  810
           7 FORMAT(45H ***SOMETHING'S WRONG WITH CNTRL CONSTANTS***/,           INA  820
            *6X,5H  NV ,5H NMAX,5H *** ,5H  NW ,5H  NS ,5H  NT ,5H  K6 ,5H  LN INA  830
            *  ,5H  LB ,5H  LT ,5H  N1 ,5H  N2 ,5H  NER,5H  IER,6H IWHEN,4H IRRINA  840
   85       *,5H KEEP,5H NHDG,/,6X,18I5)                                        INA  850
            STOP                                                                INA  860
          99 CONTINUE                                                           INA  870
      C-----                                                                    INA  880
      C... THE HEADING FOR LABELLING THE OUTPUT IS READ IN HERE                 INA  890
   90 C                                                                         INA  900
            READ(5,1) HDG                                                       INA  910
            WRITE(6,1)HDG                                                       INA  920
      C                                                                         INA  930
      C... IF REQUESTED, WE READ THE DATE                                       INA  940
   95       IF(IWHEN.NE.0)READ(5,3)WHEN                                         INA  950
      C-----                                                                    INA  960
      C... NEXT COMES THE NAME-RANGE CARD AND DATA FORMATS                      INA  970
      C                                                                         INA  980
            IF(N1.NE.0)READ(5,1)F1                                              INA  990
  100       NF2=20*N2                                                           INA 1000
            READ(5,1)(F2(L),L=1,NF2)                                            INA 1010
            WRITE(6,1)F1,(F2(L),L=1,NF2)                                        INA 1020
      C-----                                                                    INA 1030
      C... LASTLY COMES THE NAME-RANGE INFORMATION                              INA 1040
  105 C                                                                         INA 1050
        100 READ(5,F1)L,(NAY(L,J),J=1,5),(A(L,J),J=1,7)                         INA 1060
            IF(L.NE.LN)GO TO 100                                                INA 1070
            DO 101 L=1,NV                                                       INA 1080
        101 WRITE(6,2)L,(NAY(L,J),J=1,5),(A(L,J),J=1,7)                         INA 1090
  110 C-----                                                                    INA 1100
            RETURN                                                              INA 1110
      C----THIS COMPLETES THE PRELIMINARY WORK                                  INA 1120
          1 FORMAT(20A4)                                                        INA 1130
          2 FORMAT(I4,2X,4A4,A2,3F10.1,2F10.2,2F10.5)                           INA 1140
```

```
115              3 FORMAT(2A4)                                          INA 1150
                   END                                                  INA 1160
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES
1	INA77	1	111

VARIABLES	SN	TYPE		RELOCATION							
1356	A	REAL	ARRAY	DATUMS	REFS	38	109	DEFINED	106		
0	F1	REAL	ARRAY	IN	REFS	40	102	106	DEFINED	99	
24	F2	REAL	ARRAY	IN	REFS	40	102	DEFINED	101		
0	HDG	REAL	ARRAY	HEAD	REFS	39	92	DEFINED	91		
203	IER	INTEGER		IN	REFS	41	45	78			
211	INK	INTEGER		IN	REFS	40					
205	IRR	INTEGER		IN	REFS	41	45	67	DEFINED	67	
210	ISUE	INTEGER		IN	REFS	40					
204	IWHEN	INTEGER		IN	REFS	41	45	95			
370	J	INTEGER			REFS	2*106	2*109	DEFINED	2*106	2*109	
206	KEEP	INTEGER		IN	REFS	41					
174	K6	INTEGER		IN	REFS	41	45				
367	L	INTEGER			REFS	101	102	2*106	107	3*109	
					DEFINED	101	102	106	108		
176	LB	INTEGER		IN	REFS	41	45				
175	LN	INTEGER		IN	REFS	41	45	66	78	107	
					DEFINED	66					
177	LT	INTEGER		IN	REFS	41	45	70	72	78	
					DEFINED	70	72				
175	NAY	INTEGER	ARRAY	DATUMS	REFS	38	109	DEFINED	106		
202	NER	INTEGER		IN	REFS	41	45				
366	NF2	INTEGER			REFS	101	102	DEFINED	100		
207	NHDG	INTEGER		IN	REFS	41	45				
170	NL	INTEGER	ARRAY	IN	REFS	40	15*41	81			
3132	NMAX	INTEGER		DATUMS	REFS	38	74	78	81	DEFINED	74
24	NPG	INTEGER		HEAD	REFS	39					
172	NS	INTEGER		IN	REFS	41	45	67			
3133	NSUB	INTEGER		DATUMS	REFS	38					
173	NT	INTEGER		IN	REFS	41	45	78			
3131	NV	INTEGER		DATUMS	REFS	38	45	64	65	66	72	74
					3*78	81	108	DEFINED	65		
171	NW	INTEGER		IN	REFS	41	45	64	65	66	2*78
					DEFINED	64					
200	N1	INTEGER		IN	REFS	41	45	78	99		
201	N2	INTEGER		IN	REFS	41	45	78	100		
25	WHEN	REAL	ARRAY	HEAD	REFS	39	DEFINED	95			
0	X	REAL	ARRAY	DATUMS	REFS	38	70				

FILE NAMES	MODE						
TAPE5	MIXED	READS	63	91	95	99	101	106
TAPE6	MIXED	WRITES	73	81	92	102	109	

```
INLINE FUNCTIONS   TYPE    ARGS        OEF LINE  REFERENCES
      MAX0       INTEGER    0  INTRIN              66        78

NAMELISTS         OEF LINE     REFERENCES
      CNTRL            45        63        73

STATEMENT LABELS              OEF LINE   REFERENCES
  353  1        FMT              113        91        92        99       101       102
  355  2        FMT              114       109
  362  3        FMT              115        95
  247  7        FMT               82        81
   60  99                         87        78
  106  100                       106       107
    0  101                       109       108

LOOPS  LABEL     INDEX      FROM-TO    LENGTH    PROPERTIES
  111          * J          106 106       118              EXT REFS
  123          * J          106 106       118              EXT REFS
  140  101     * L          108 109       328              EXT REFS  NOT INNER
  143          * J          109 109       118              EXT REFS
  155          * J          109 109       118              EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
      OATUMS      1628               0 X       (125)          125 NAY     (625)          750 A       (875)
                                  1625 NV      (1)           1626 NMAX    (1)           1627 NSUB    (1)
      HEAD          23               0 HOG     (20)            20 NPG     (1)             21 WHEN    (2)
      IN           138               0 F1      (20)            20 F2      (100)          120 NL      (16)
                                   136 ISUE    (1)            137 INK     (1)

EQUIV CLASSES   LENGTH     MEMBERS - BIAS NAME(LENGTH)
F1    NL            16               1 NW      (1)             2 NS      (1)             3 NT      (1)
                                     4 K6      (1)             5 LN      (1)             6 LB      (1)
                                     7 LT      (1)             8 N1      (1)             9 N2      (1)
                                    10 NER     (1)            11 IER     (1)            12 IWHEN   (1)
                                    13 IRR     (1)            14 KEEP    (1)            15 NHOG    (1)

STATISTICS
  PROGRAM LENGTH                 3718     249
  CM LABELED COMMON LENGTH      33758    1789
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```
1               SUBROUTINE IN877                                                  INB   10
              C-----                                                              INB   20
              C     IN877 IS OUR DATA INPUT AND ALTERATION ROUTINE.  IT BRINGS IN DATA INB   30
              C     OF THE FORM-- NSUB,(X(I),I=1,NW) --FOR EACH SUBJECT, ROUTINELY INB   40
5             C     CALLS SUBROUTINE NUNU99 FOR POSSIBLE DATA ALTERATIONS, PRINTS OUT INB   50
              C     DATA FOR A SPECIFIED FRACTION OF THE SUBJECTS, AND, IF REQUESTED, INB   60
              C     CHECKS TO SEE THAT THE DATA ARE IN THE SPECIFIED RANGE.           INB   70
              C                                                                       INB   80
              C-----                                                              INB   90
10              COMMON/DATUMS/X(125),NAY (125,5),A(125,7),NV,NMAX,NSUB            INB  100
                COMMON/HEAD/HDG(20),NPG,WHEN(2)                                   INB  110
                COMMON/IN/F1(20),F2(100),NL(16),ISUE,INK                          INB  120
                EQUIVALENCE(NL(2),NW),(NL(3),NS),(NL(4),NT),(NL(5),K6),(NL(6),LN),INB  130
               *(NL(7),L8),(NL(8),LT),(NL(9),N1),(NL(10),N2),(NL(11),NER),(NL(12),INB  140
15             *IER),(NL(13),IWHEN),(NL(14),IRR),(NL(15),KEEP),(NL(16),NHOG)      INB  150
              C-----                                                              INB  160
                MX=-1                                                             INB  170
              C... WE CHECK HERE TO SEE IF THE REQUESTED AMOUNT OF DATA HAS BEEN READ INB  180
              C     IN YET                                                        INB  190
20            C                                                                   INB  200
                IF (INK.NE.IRR.AND.ISUE.NE.NS) GOTO200                            INB  210
                WRITE( 6,6) NS,IRR                                                INB  220
              6 FORMAT(46H THE INPUT ENDS WITH, AS REQUESTED EITHER THE, I5,      INB  230
               121HTH RECORD READ OR THE, I5,19HTH RECORD PROCESSED)              INB  240
25            C-----                                                              INB  250
              C... ALL THE DATA IS IN.  WE LET EDIT KNOW BY SETTING NSUB=-13, THEN INB  260
              C     RETURN CONTROL TO EDIT FOR FINAL PROCESSING                   INB  270
              C                                                                   INB  280
                NSUB=-13                                                          INB  290
30              RETURN                                                            INB  300
              C-----                                                              INB  310
              200 ISUE=ISUE+1                                                     INB  320
              C... THE SUBJECT DATA IS READ IN HERE                               INB  330
              C                                                                   INB  340
35              READ(NT,F2)NSUB,(X(I),I=1,NW)                                     INB  350
              C                                                                   INB  360
              C... A CHECK FOR THE END OF THE DATA                                INB  370
                IF(NSUB.LE.0)GOTO201                                              INB  380
                IF(EOF(NT))201,202                                                INB  390
40            201 NSUB=-13                                                        INB  400
                WRITE(6,50)MSUB,INK,ISUE                                          INB  410
               500FORMAT(63H ***DATA INPUT COMPLETED WITH READING OF RECORD FOR SUBJINB  420
                 1ECT NO.,I5,14H. THIS WAS THE, I5,19HTH RECORD USED, THE,I5,14HTH RINB  430
                 2ECORD READ )                                                    INB  440
45              RETURN                                                            INB  450
              202 CONTINUE                                                        INB  460
              C-----                                                              INB  470
              C     **********      WE CALL NUNU99      **********                INB  480
              C                                                                   INB  490
50              CALL NUNU99 (KEEP)                                                INB  500
              C                                                                   INB  510
              C... IF KEEP WAS SET TO SOMETHING OTHER THAN 1492 IN NUNU99, THE CURRENTINB  520
              C     SUBJECT IS REJECTED AND WE GO BACK UP TO READ THE NEXT        INB  530
                IF (KEEP.NE.1492) GO TO 200                                       INB  540
55            C-----                                                              INB  550
                INK=INK+1                                                         INB  560
              C-----                                                              INB  570
```

```
                C... WE PRINT OUT THE FIRST TEN SUBJECTS DATA PLUS DATA FOR EVERY K6TH  INB  580
                C    SUBJECT                                                          INB  590
          60    C                                                                     INB  600
                      IF(INK.LE.10.OR.INK.EQ.K6*(INK/K6))                           INB  610
                     *WRITE(6,110)INK,NSUB,(X(L),L=1,NV)                            INB  620
                      MSUB=NSUB                                                     INB  630
                C                                                                   INB  640
          65          IF (LT.EQ.0) RETURN                                           INB  650
                C-----                                                              INB  660
                C... IF REQUESTED, THE DATA ARE NOW CHECKED FOR OUT OF RANGE VALUES FOR INB  670
                C    VARIABLES LB TO LT                                             INB  680
                C                                                                   INB  690
          70          DO 111 L=LB,LT                                                INB  700
                      IF(X(L).GE.A(L,1).AND.X(L).LE.A(L,2))GO TO 111                INB  710
                      IF (X(L).EQ.0.0) GO TO 111                                    INB  720
                      WRITE(6,112)NSUB,L,X(L),A(L,1),A(L,2)                         INB  730
                C                                                                   INB  740
          75    C*IF FIRST ERROR FOR THIS SUBJECT, REDUCE NER BY 1                  INB  750
                      IF (NSUB.NE.MX) NER=NER-1                                     INB  760
                      IF (NER.LT.0) GO TO 999                                       INB  770
                C    IF AN OUTOF RANGE VALUE IS OBSERVED, ONE OF THREE THINGS CAN   INB  790
                C                  HAPPEN...                                        INB  800
          80    C        IF  IER=0, THE RECORD IS REJECTED AND A NEW ONE READ       INB  810
                C        IF  IER=1, THE VALUE IN QUESTION IS SET EQUAL TO ZERO      INB  820
                C        IF  IER>1, THE VALUE IS SET EQUAL TO THE APPROXIMATE MEAN  INB  830
                C                                                                   INB  840
                      IF (IER.NE.0) GO TO 101                                       INB  850
          85          INK=INK-1                                                     INB  860
                      GO TO 200                                                     INB  870
                  101 CONTINUE                                                      INB  880
                      X(L)=0.0                                                      INB  890
                      IF (IER.GT.1) X(L)=A(L,3)                                     INB  900
          90          MX=NSUB                                                       INB  910
                  111 CONTINUE                                                      INB  920
                C-----                                                              INB  930
                      RETURN                                                        INB  940
                C                                                                   INB  950
          95      999 WRITE(6,998)                                                  INB  960
                      STOP                                                          INB  970
                  110 FORMAT(7H NREC =,I5,8H  NSUB =,I5,/,(20F6.0))                 INB  980
                  112 FORMAT(6H NSUB=,I4,4H  X(,I3,2H)=,F10.2,5X,5H MIN=,F6.1,2X,5HMAX=,INB  990
                     *F6.1)                                                         INB 1000
         100      998 FORMAT(//6H **** ,48HALLOWABLE NUMBER OF OUT-OF-RANGE VALUES EXCEEINB 1010
                     *DED)                                                          INB 1020
                      END                                                           INB 1030
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
1 INB77	1	30 45 65 93

VARIABLES	SN	TYPE	RELOCATION								
1356	A	REAL	ARRAY	DATUMS	REFS	10	2*71	2*73	89		
0	F1	REAL	ARRAY	IN	REFS	12					
24	F2	REAL	ARRAY	IN	REFS	12	35				
0	HDG	REAL	ARRAY	HEAD	REFS	11					
246	I	INTEGER			REFS	35	DEFINED	35			
203	IER	INTEGER		IN	REFS	13	84	89			
211	INK	INTEGER		IN	REFS	12	21	41	56	4*61	85
					DEFINED	56	85				
205	IRR	INTEGER		IN	REFS	13	21	22			
210	ISUE	INTEGER		IN	REFS	12	21	32	41	DEFINED	32
204	IWHEN	INTEGER		IN	REFS	13					
206	KEEP	INTEGER		IN	REFS	13	50	54			
174	K6	INTEGER		IN	REFS	13	2*61				
250	L	INTEGER			REFS	61	4*71	72	4*73	88	2*89
					DEFINED	61	70				
176	LB	INTEGER		IN	REFS	13	70				
175	LN	INTEGER		IN	REFS	13					
177	LT	INTEGER		IN	REFS	13	65	70			
247	MSUB	INTEGER			REFS	41	DEFINED	63			
245	MX	INTEGER			REFS	76	DEFINED	17	90		
175	NAY	INTEGER	ARRAY	DATUMS	REFS	10					
202	NER	INTEGER		IN	REFS	13	76	77	DEFINED	76	
207	NHDG	INTEGER		IN	REFS	13					
170	NL	INTEGER	ARRAY	IN	REFS	12	15*13				
3132	NMAX	INTEGER		DATUMS	REFS	10					
24	NPG	INTEGER		HEAD	REFS	11					
172	NS	INTEGER		IN	REFS	13	21	22			
3133	NSUB	INTEGER		DATUMS	REFS	10	38	61	63	73	76 90
					DEFINED	29	35	40			
173	NT	INTEGER		IN	REFS	13	39	I/O REFS	35		
3131	NV	INTEGER		DATUMS	REFS	10	61				
171	NW	INTEGER		IN	REFS	13	35				
200	N1	INTEGER		IN	REFS	13					
201	N2	INTEGER		IN	REFS	13					
25	WHEN	REAL	ARRAY	HEAD	REFS	11					
0	X	REAL	ARRAY	DATUMS	REFS	10	61	2*71	72	73	
					DEFINED	35	88	89			

FILE NAMES	MODE						
TAPE6	FMT	WRITES	22	41	61	73	95

VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS	TYPE	ARGS	REFERENCES
EOF	REAL	1	39
NUNU99		1	50

STATEMENT LABELS			DEF LINE	REFERENCES		
130	6	FMT	23	22		
160	50	FMT	42	41		
102	101		87	84		
220	110	FMT	97	61		
111	111		91	70	71	72
225	112	FMT	98	73		
14	200		32	21	54	86
27	201		40	38	39	
33	202		46	39		
234	998	FMT	100	95		

STATEMENT LABELS

		DEF LINE	REFERENCES
114	999	95	77

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	EXT REFS	EXITS
56	111	* L	70 91	368			

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)						
OATUMS	1628	0	X	(125)	125	NAY	(625)	750	A	(875)
		1625	NV	(1)	1626	NMAX	(1)	1627	NSUB	(1)
HEAD	23	0	HOG	(20)	20	NPG	(1)	21	WHEN	(2)
IN	138	0	F1	(20)	20	F2	(100)	120	NL	(16)
		136	ISUE	(1)	137	INK	(1)			

EQUIV	CLASSES	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)					
F1	NL	16	1	NW	(1)	2	NS	(1)	3	NT	(1)
			4	K6	(1)	5	LN	(1)	6	LB	(1)
			7	LT	(1)	8	N1	(1)	9	N2	(1)
			10	NER	(1)	11	IER	(1)	12	IWHEN	(1)
			13	IRR	(1)	14	KEEP	(1)	15	NHDG	(1)

STATISTICS

PROGRAM LENGTH	2518	169
CM LABELED COMMON LENGTH	33758	1789

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      SUBROUTINE NUNU99     74/74   OPT=1                    FTN 4.5+414        02/01/78  14.24.15       PAGE      1

      1                SUBROUTINE NUNU99 (KEEP)                                                NUNU  10
                     C-----                                                                    NUNU  20
                     C... THIS SUBROUTINE'S FUNCTION IS FOR MAKING CHANGES IN THE DATA.  IT    NUNU  30
                     C    ROUTINELY DOES NOTHING EXCEPT RETURN CONTROL TO IN877.  IT IS IN     NUNU  40
      5              C    THIS ROUTINE THAT WE FABRICATE NEW VARIABLES, AFTER THE REGULAR      NUNU  50
                     C    VARIABLES, OR ELIMINATE DATA RECORDS BY INSERTING SECTIONS OF        NUNU  60
                     C    PROGRAM CODE.                                                       NUNU  70
                     C                                                                        NUNU  80
                     C-----                                                                   NUNU  90
     10              C... WHEN MAKING AN XVAL RUN, THIS ROUTINE SHOULD ALWAYS BE CHECKED TO   NUNU 100
                     C    INSURE NO UNWANTED DATA CHANGES FROM A PREVIOUS RUN REMAIN.         NUNU 110
                     C-----                                                                   NUNU 120
                     C                                                                        NUNU 130
                          COMMON/DATUMS/X(125),NAY (125,5),A(125,7),NV,NMAX,NSUB              NUNU 140
     15              C-----                                                                   NUNU 150
                     C.....IF KEEP .NE.1492, THE RECORD JUST READ IS IGNORED                  NUNU 160
                     C                                                                        NUNU 170
                          KEEP=1492                                                           NUNU 180
                          RETURN                                                              NUNU 190
     20                   END                                                                 NUNU 200


      SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS     DEF LINE     REFERENCES
    3  NUNU99          1       19

VARIABLES     SN  TYPE           RELOCATION
 1356  A          REAL       ARRAY     DATUMS        REFS        14
    0  KEEP       INTEGER                F.P.       DEFINED      1        18
  175  NAY        INTEGER    ARRAY     DATUMS        REFS        14
 3132  NMAX       INTEGER              DATUMS        REFS        14
 3133  NSUB       INTEGER              DATUMS        REFS        14
 3131  NV         INTEGER              DATUMS        REFS        14
    0  X          REAL       ARRAY     DATUMS        REFS        14

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
      DATUMS     1628              0 X      (125)          125 NAY    (625)          750 A      (875)
                                1625 NV     (1)           1626 NMAX   (1)         1627 NSUB   (1)

STATISTICS
  PROGRAM LENGTH                 78       7
  CM LABELED COMMON LENGTH     31348    1628
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