

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER LABORATORY
ILLIAC PROGRAM LIBRARY

Library Routine K 15 - 258

TITLE: Analysis of Variance by Method of Fitting of Constants
TYPE: Complete program (SADOI or DOI)

DURATION: Approximate time in milliseconds

Read-in: $10S(N^2 + N)$

Compute: $2(N - K)^3$

Output: $136(N^2 + 3N + K^2 - K)$

where S = Number of samples

N = Total number of variables

K = Number of dependent variables

METHOD OF USE:

The program is read into the machine in the usual way. After read-in a sum check is performed and if the tape has been read in correctly the machine will stop on the order $24(042)_{16}$. Next the parameter tape is read in and the machine stops on $24(084)_{16}$ from $04K$. The data tape is now read in and the machine prints out the required information for the analysis of variance; gross sums of squares and cross products, constants, inverse matrix and accounted for sums of squares and cross products.

CAPACITY:

The total number of variables must satisfy the inequalities:

$$\frac{N - K}{2} [3N - K + 3] + N \leq 792 \text{ and } N < 30$$

If $K = 1$, then $N = 22$. There is no limit on S unless the accumulated sums of squares exceeds 2^{39} .

PUNCHING TAPES:

Parameters needed are

1. s = sample size. Punch sS on the tape.
 2. n = total number of variables. Punch nN on the tape.
 3. k = number of dependent variables. Punch kK on the tape.
- Immediately following the K there must be punched two carriage returns and then any identification desired, either letters preceded by a letter shift or numbers preceded by a number shift or any combination. At the end of the identification punch a 5th hole delay.

Each observation is represented by a row of coefficients indicating the relationship of the observation to the constants to be fitted. These coefficients are each preceded by a + or - sign as appropriate, and the dependent variable s is the last item punched. These coefficients describe the complete classification of each observation; use a zero if the observation did not occur in a class and a 1 if it did. Constants for single degrees of freedom can be calculated by use of appropriate coefficients. Follow this by the terminating symbol N. If weights other than 1 are desired for any row of this observation matrix, precede the row by the numerical weight j punched as +jJ. The machine in effect treats these rows as if they occurred j times. If a terminating N is changed to F then the machine will stop so that another piece of the data tape can be inserted in the reader.

METHOD USED:

The method is essentially that described in Kempthorne, "Design and Analysis of Experiments", page 79. The machine accumulates a sum of squares and cross products matrix from the observation matrix being read in. This matrix is inverted and solved for the various constants. The constants are printed out along with the inverse matrix for calculation of the standard errors of the constants.

The standard errors of the constants can be calculated as follows. Subtract "Accounted for Sum of Squares" from "Raw Sum of Squares". This Residual Sum of Squares is divided by $S - (N - K)$ to provide Residual Variance. The diagonal elements of the inverse matrix multiplied by the residual variance give the Variances for each constant. The square roots of these Variances of Constants are the standard errors.

If $k > 1$, then the covariance model is in effect and the constants printed out are for the k variables in inverse order, i.e., the last variable first, next to the last 2nd, etc.

1. If the drum fails, the machine will stop on an FF 010 from location 03K.
2. If an accumulated number exceeds 2^{39} the machine will stop on an FF(201)₁₆ from location 099.
3. If any row of the observation matrix fails to have the correct number of variables the machine will stop on FF(200)₁₆ from location 08F.

DATE	<u>March 6, 1959</u>
PROGRAMMED BY	<u>G.H. Golub</u>
DESCRIPTION BY	<u>W.C. Jacob</u>
APPROVED BY	<u><i>J. Snyder</i></u>

lgr

LOCATION	ORDER		NOTES	PAGE 1
	00 3K			
0	00 F			
	00 500F	S3		
1	00 F			
	00 220F	S4		
2	00 F			
	00 12F	S5	Constants	
3	00 F			
	00 250F	S6		
4	00 F			
	00 3560F	S7	Store matrix on drum	
5	00 F			
	00 26F	S8	Y 1	
6	00 F			
	00 327F	S9	P 7	
7	00 F			
	00 4560F	SK	Inverse matrix	
8	00 F			
	00 2560F	SS	Store program on drum	
	00 12K			
0	00 S3			
	00 S3			
1	00 F		S3 + N	
	00 F			
2	80 F			
	00 F		N*	
3	80 F			
	00 F		Store number of samples	
4	80 F			
	00 F			
5	00 1F			
	00 1F			
6	80 F		$\frac{N^2 + N}{2}$ Matrix size	
	00 F			
7	80 F			
	00 F		K*	

LOCATION	ORDER	NOTES	PAGE 2
8	00 F 00 10F		
9	00 F 00 1F		
10	80 F 00 F		(N - K)*
11	00 F 00 F		
12	00 F 00 F		
13	00 F 00 F		Store *N* number
	00 26K Library Routine Y 1 - 199		Transfer Block of Words from the Memory to the Drum or from the Drum to the Memory
	00 66K		
0	50 100F 50 L		Bring parameter section et al from drum
1	26 S8 00 SS		
2	00 150F 00 1F		
3	50 250F 50 3L		
4	26 S8 00 151SS		
5	00 127F 50 5L		
6	26 100F 50 6L		To 100 section
7	24 132F 00 1F		TO 132 section after stop
8	J0 32S9 50 8L		
9	26 S9 50 9L		

LOCATION	ORDER	NOTES	PAGE 3
10	26 167F 00 1F		
11	50 90F 50 11L		
12	26 S8 00 300SS		
13	00 142F 50 13L		
14	26 90F 00 1F		
15	50 100F 50 15L		
16	26 S8 00 450SS		
17	00 91F 00 1F		
18	50 250F 50 18L		
19	26 S8 00 151SS		
20	00 127F 50 20L		
21	26 100F 24 L		
0	00 100K K5 F		
1	42 29L L5 30L		
2	40 2L 00 11F		
3	41 F F5 2L		Clear from S3 - 1024
4	40 2L L0 31L		
	36 2L		

LOCATION	ORDER	NOTES	PAGE 4
5	19 2F		
	40 5F		
6	92 135F		
	41 7F		
7	81 4F		
	10 8S5		- 10 Read in parameters
8	32 11L		
	14 8S5		+ 10
9	50 7F		
	74 8S5		x 10
10	S5 F		
	40 7F		
11	26 7L		
	42 12L		
12	15 7F		
	40 F		Store parameters
13	15 5F		
	14 5F		
14	40 5F		
	32 6L		
15	15 1F		
	14 4S5		
16	40 3S5		
	15 2F		
17	42 13S5		
	00 20F		
18	46 13S5		
	15 2F		
19	42 2S5		
	10 0F		
20	42 10S5		
	15 0F		
21	42 7S5		
	00 1F		
22	50 F		
	50 22L		

LOCATION	ORDER	NOTES	PAGE 5
23	26 S9 92 707F		To P 7
24	92 131F 92 515F		
25	L5 S5 L4 13S5		
26	40 1S5 L5 2S5		
27	50 2S5 74 2S5		
28	S5 F 10 1F		
29	42 6S5 22 F		Link
30	00 11F 41 S3		
31	80 11F 41 1024F		
0	00 132K K5 F		
1	42 33L L5 4L		
2	L4 13S5 46 34L		
3	41 5F L5 9S5		
4	40 6F J0 S3		Put 1 x 2 ⁻³⁹ in 6F
5	50 4L 26 S4		Read in 1 line
6	26 245F 00 F		Test for J, F or L
7	L5 S3 40 6F		Set 6F for J number
	22 4L		

LOCATION	ORDER		NOTES	PAGE 6
8	L5 10S4			
	L0 34L		Check for correct N	
9	40 2F			
	L3 2F			
10	36 11L			
	FF 512F		Stop if not right	
11	L5 1S5			
	46 17L			
12	46 24L			
	L5 2F			
13	40 1F	0 → 1F		
	L4 S5			
14	42 15L			
	42 17L			
15	50 6F			
	75 F	by 14	S3	
16	00 39F			
	40 OF			
17	L5 F	by 11	S3 + N	
	50 F	by 14	S3	
18	74 OF			
	40 OF			
19	36 20L			
	F4 12S5		+ 1 + 2 ⁻³⁹ in A	
20	40 4F			
	L3 4F			
21	36 22L			
	FF 513F		Test for overflow	
22	L5 OF			
	32 23L			
23	F4 4S5			
	S4 F			
24	40 F	by 12	S3 x N	
	L5 24L			
25	L4 5S5			
	46 24L			

LOCATION	ORDER	NOTES	PAGE 7
26	46 17L		
	F5 15L		
27	42 15L		
	F5 1F		
28	40 1F		
	L0 2S5		Count N
29	36 15L		
	F5 2F		
30	40 2F		
	L0 2S5		Count N
31	32 12L		
	F5 5F		
32	40 5F		
	L0 3S5		Count S
33	36 3L		
	22 F		Link
34	40 F		Location of last term in line
	L5 10S4		
	00 167K		
0	K5 F		
	42 51L		
1	L5 1S5		
	L4 6S5		
2	L0 5S5		
	42 5L		
3	F5 4S5		
	40 3F		
4	41 4F		
	92 131F		
5	92 515F		
	L5 F		
6	56 F		
	50 6L		
7	26 21S6		To print out
	L5 5L		

LOCATION	ORDER	NOTES	PAGE 8
8	L0 5S5 42 5L	- 1	
9	F5 4F 40 4F		
10	L0 3F 32 4L		
11	92 131F F5 3F		
12	40 3F L5 4F		
13	L0 7S5 36 4L		
14	F5 5L 42 52L		
15	L5 1S5 42 16L		
16	41 OF L3 F		
17	40 2F L6 OF		
18	32 19L L7 2F		
19	40 OF F5 16L		
20	42 16L L0 52L		
21	32 16L 41 11S5		
22	50 12S5 F5 11S5		
23	42 11S5 L7 OF		
24	00 1F 40 OF		
25	32 22L L5 13S5		

LOCATION	ORDER	NOTES	PAGE 9
26	46 44L 41 1F		
27	L5 11S5 42 32L		
28	L5 1S5 L4 1F		
29	42 31L L5 0S5		
30	42 33L 41 0F		
31	50 12S5 L5 F		
32	10 2F 00 F		
33	32 33L 40 F		
34	F5 33L 42 33L		
35	L5 0F L0 1F		
36	32 38L L5 2S5		
37	F0 0F L4 31L		
38	26 39L F5 31L		
39	42 31L F5 0F		
40	40 0F L0 2S5		
41	36 31L 00 1F		
42	J0 S3 50 42L		
43	26 S8 00 S7		

LOCATION	ORDER	NOTES	PAGE 10
44	00 F F5 43L		N
45	L4 2S5 L4 4S5		
46	40 43L F5 1F		
47	40 1F L0 10S5		
48	36 28L F5 41L		
49	42 32L L5 1F		
50	L0 2S5 36 28L		
51	00 1F 22 F		Link
52	N1 OF L3 F		
0	00 220K K5 F		
1	46 10L 42 13L		
2	40 24L 81 4F		
3	L0 22L 22 12L	- 10	
4	40 2F L1 24L		
5	32 8L 50 1F		
6	L1 1F L4 F		
7	66 1F 10 1F		
	SJ F		

LOCATTON	ORDER		NOTES	PAGE 11
8	40 F L1 F			
9	40 1F L5 F	by 12		
10	40 F L5 10L		S 3	
11	L4 L 46 10L			
12	L5 2F 42 9L			
13	L0 23L 32 F	- 2	Link (N)	
14	41 F 49 1F		1/2 in A and 1	
15	81 4F L0 22L	- 10		
16	32 3L 10 3F			
17	F4 F 00 2F			
18	F4 F 00 1F			
19	40 F 50 22L			
20	75 1F S4 F	x 10		
21	40 1F 26 15L			
22	00 F 00 10F			
23	00 F 00 2F			
24	00 F 00 F			
25	L0 9S5 32 246F		- 1 Test for +. Yes = J or F	

LOCATION	ORDER	NOTES	PAGE 12	K 15
26	26 140F L0 9S5		No = N - 1	
27	36 248F 22 138F		If + = F = J	
28	L0 9S5 36 140F		- 1 If + = L	
29	24 140F 00 F 00 250K		= F	
0	40 1F K5 F			
1	42 20L L5 10L			
2	46 19L L1 3F			
3	32 15L L5 3F			
4	42 6L 42 13L			
5	L5 1F 50 0F			
6	32 6L 00 F			
7	40 2F 50 9S5			
8	L5 17L L4 19L			
9	46 19L 75 8S5			
10	S1 12F L6 2F			
11	36 8L S5 F			
12	40 2F L5 1F			

LOCATION	ORDER	NOTES	
13	50 OF 00 F		
14	66 2F S5 F		
15	22 19L 14 9S5		
16	00 20F 46 18L		
17	50 99F L5 OF		
18	10 F 00 1F		
19	54 F 50 19L		
20	26 21L 22 F		Link
21	00 F 00 21L		
22	50 21L 26 999F		
23	00 F 26 22L 26 1N		
0	40 F L5 3L		
1	22 2L 40 F		
2	L5 8L 46 40L		
3	K5 963F 40 2F		
4	42 42L 49 1F		

LOCATION	ORDER		NOTES
5	00 7F 11 26F		
6	66 47L 00 24F		
7	40 55L 10 4F		
8	S0 515F L4 54L		
9	22 13L L1 2F		
10	00 6F 36 13L		
11	50 1F 75 52L		
12	S4 642F 40 1F		
13	L5 27L L4 5L		
14	40 55L 32 9L		
15	L1 2F 00 5F		
16	32 19L 00 1F		
17	36 19L 50 55L		
18	00 45F 42 55L		
19	47 55L 19 1F		
20	50 1F 74 F		
21	32 27L 00 1F		
22	40 F L1 F		

LOCATION	ORDER	NOTES	PAGE 15
23	40 F L5 34L		
24	46 40L 50 53L		
25	L5 F 32 30L		
26	L1 33L 26 31L		
27	LL 4064F 00 1F		
28	40 F L1 2F		
29	32 24L L5 12L		
30	26 24L L5 33L		
31	74 F 36 33L		
32	L4 53L L4 53L		
33	10 35F 40 F		
34	S5 706F 40 1F		
35	L5 50L L4 55L		
36	40 55L 36 39L		
37	00 29F 36 39L		
38	L3 F 36 41L		
39	L3 2F 36 41L		
40	92 F 41 2F		

LOCATION	ORDER	NOTES	PAGE 16	K 15
41	L5 55L 32 50L			
42	00 20F 32 F			
43	L3 2F L4 F			
44	32 47L L5 55L			
45	00 35F 32 48L			
46	92 963F 22 48L			
47	00 F 00 100F			
48	82 4F 50 1F			
49	75 52L 22 33L			
50	00 2F 09 65F			
51	92 643F 22 35L			
52	00 F 00 10F			
53	2S 4015F LN 755F			
54	LL 4071F 90 1283F			
55	00 F 00 F 00 327K			
	Library Routine P 7 - 125		Letter Printing	
0	00 850K 40 32S9 50 L		Interlude to	

LOCATION	ORDER	NOTES	PAGE 17
1	26 S9 00 1F		read in
2	40 37S9 50 2L		letters
3	26 S9 00 1F		
4	40 40S9 50 4L		
5	26 S9 00 1F		
6	40 43S9 50 6L		
7	26 S9 26 999F 26 850N		
<p>Letters for Labels Follow</p> <p>CR Delay LS R</p> <p>A W Δ S</p> <p>F Δ S Q</p> <p>U A R E</p> <p>S CR Delay A</p> <p>N D Δ P</p> <p>R O D U</p> <p>C T S CR</p> <p>Delay NS (5)</p> <p>CR Delay LS F</p> <p>I T T E</p> <p>D Δ C O</p> <p>N S T A</p> <p>N T S NS</p> <p>CR Delay (5)</p> <p>CR Delay LS I</p> <p>N V E R</p> <p>S E Δ M</p> <p>A T R I</p> <p>X NS CR Delay</p> <p>(5)</p>			

LOCATION	ORDER	NOTES	PAGE 18	K 15
	Δ CR CR Delay LS A C C O U N T E D Δ F O R Δ S U M Δ O F Δ CR Delay S Q U A R E S Δ A N D Δ P R O D U C T S NS CR Delay ⑤			
0	00 90K K5 F 42 8L			
1	L5 10S5 00 20F			
2	46 6L 14 5S5			
3	46 24L L5 13S5			
4	42 7L 46 11L			
5	14 21L 42 17L			
6	50 F L5 6L	by 2		N - K
7	26 27L 00 F	by 4		To M 14 N
8	00 1F 22 F	by 0		Link
9	50 142L 50 9L			From 22 in M 14

LOCATION	ORDER		NOTES	PAGE 19
10	26 S8 00 S7			
11	00 F L5 21L	by 4	N	
12	L4 13S5 42 13L			
13	41 1F 41 F		142 L + N	
14	F5 13L 42 13L		Clear	
15	F5 1F 40 1F			
16	L0 10S5 32 13L			
17	19 1F 40 OF	by 5	1/4 N + 142 L	
18	F5 17L 42 17L			
19	F5 10L L4 2S5			
20	L4 4S5 40 10L			
21	22 48L 00 142L		Back to M 14	
22	J0 142L 50 22L		From 105 in M 14	
23	26 S8 00 SK			
24	00 F F5 23L	by 3	(N - K) + 1	
25	F4 10S5 L4 4S5			
26	40 23L 26 133L			
27	00 F 00 27L		0	

LOCATION	ORDER	NOTES	
28	50 27L 26 999F		1
29	00 F 26 28L 26 1N		Library M 14 - 180 Modified follows next

LOCATION	ORDER		NOTES	PAGE 21
0	42 15L 40 F		Set p Store	
1	41 3F 41 4F		Clear counters	
2	41 7F F5 F			
3	42 10L L4 87L		Set p + 1 Right address p + 2	
4	46 76L 46 83L			
5	42 108L 10 20F		Link Set address of $y = x + 114 + n$	
6	42 75L 42 91L			
7	42 19L L0 43L			
8	42 3F L5 45L		Store n	
9	42 22L L5 91L		Set y	
10	42 16L L5 (p+1)F	3		
11	42 4F L4 91L		Set m	
12	42 23L 42 45L			
13	42 112L 42 114L		Set address $y + m = t$	
14	00 20F 46 113L			
15	41 6F L5 (p)F	0	Clear counter Test for inversion or solving $Ax = B$	
16	36 21L 41 (y)F	10,17'		

LOCATION	ORDER		NOTES	PAGE 22
17	F5 16L 42 16L		Clear y to (y + n - 1)	
18	L0 112L 32 16L			
19	L5 111L 40 (y)F	7,20 ^r	1/10	
20	F5 19L 42 19L		Augment unit matrix	
21	26 1006L L3 7F		To Auxiliary I	
22	32 23L 41 F	9		
23	26 24L 41 (t)F	12	Cause ith row to interchange with virtual ith row	
24	L5 45L 42 35L			
25	42 38L 42 41L			
26	42 51L L5 43L			
27	L4 6F 42 44L			
28	42 48L 42 64L		Set addresses	
29	42 66L 42 39L			
30	00 20F 46 38L			
31	46 36L 46 42L			
32	46 48L 46 50L			
33	L5 109L 46 45L		Prepare for interchange of rows	

LOCATION	ORDER	NOTES	PAGE 23	K 15
34	46 46L 46 65L			
35	42 65L L3 (t)F	24'	Test size of leading elements	
36	L6 (x)F 32 39L	31		
37	47 45L 50 7F		No row interchange Approximately zero in Q	
38	L5 (x)F 66 (t)F	30' 25'		
39	26 43L 50 (x)F	29'		
40	83 F 32 42L			
41	50 110L 75 (t)F	25'	1 - 2 ⁻³⁹	
42	66 (x)F 47 46L	31'	Row interchange	
43	41 5F 81 115L		Address a parameter	
44	40 2F L5 (x)F	27,55		
45	40 F L5 (t)F	33',37' 12',53'		
46	40 F 50 2F	34,42'		
47	7J 1F L4 F			
48	40 (x)F L3 (x)F	33,54' 28,54'		
49	L6 5F 36 51L		Store absolute value of largest element of row	Linearly combine successive rows so as to get zeros
50	L7 (x)F 40 5F	32',55'		

LOCATION	ORDER		NOTES	PAGE 24
51	L5 1F 40 (t)F	26,32'		below the diagonal of A
52	F5 51L 42 51L			
53	42 45L L5 48L			
54	L4 109L 40 48L			
55	46 50L 42 44L			
56	L0 113L 32 44L			
57	L3 5F 32 69L		If zero don't rescale	
58	LL 5F 32 61L		$\geq 1/2?$	
59	L5 66L 46 65L			
60	26 64L F5 65L		If $H(5) \geq 1/2$ multiply row by 1/2 (scale down)	
61	42 65L L5 5F			
62	00 1F 40 5F		Determine if possible to scale up $< 1/2 H(5) \leq 1/4$	
63	LL 5F 32 60L			
64	50 7F L5 (x)F	68,28'		
65	10 (1)F 00 (1)F	34',59'		
66	50 2F 40 (x)F	35,61 67',29'	Waste	Rescale rows
67	F5 66L 42 66L			
68	42 64L L0 114L			

LOCATION	ORDER		NOTES	PAGE 25
69	36 64L F5 6F			
70	40 6F L5 7F			
71	L0 6F 36 24L		Determine if row i must have further eliminations (done 1 times)	
72	F5 7F 40 7F			
73	L0 3F 32 74L		Count number of rows	
74	22 8L 41 5F		Repeat for next row Set counter	
75	L5 11L 40 (y)F	6	Set scaling factor	
76	L3 (y)F 36 11L	4	Terminate calculation if scaling $< 2^{-39}$	
77	41 6F 41 7F		Clear counters	
78	L5 45L 42 88L			
79	L0 4F L4 5F			
80	42 83L L5 88L		Set addresses	
81	L0 4F 42 88L			
82	L5 83L 46 88L			
83	50 (y)F 71 F	4 80,86		
84	40 F L5 83L			
85	F0 7F L0 4F			

LOCATION	ORDER		NOTES	PAGE 86
86	42 83L			Calculate $\sum_{j=i+1}^n a_{ij}^2$ Also acts as constant
	22 92L			
87	85 114L			
	50 1F			
88	50 (y)F	82, 93		
	74 F	78, 81, 93		
89	L4 F			
	40 F			
90	LL F			
	32 92L		$\geq 1/2?$	
91	50 111L			Rescale and start again
	7J (y)F	6		
92	22 75L			
	L5 88L			
93	L0 109L			
	40 88L			
94	42 98L		Set addresses	
	42 101L			
95	46 103L			
	F5 6F			
96	40 6F			Count (n-i+1) times for row i
	L5 7F			
97	L0 6F			
	36 87L			
98	41 6F		Reset counter	
	L3 (a ₁₁)F	94	End if zero on diagonal	
99	36 111L			
	L6 F			
100	36 91L		Test if division is proper	
	26 101L		Waste	
101	L5 F			Waste
	66 (a ₁₁)F	94		
102	22 102L			
	S1 F		Waste	

LOCATION	ORDER		NOTES	PAGE 27
103	40 (y-1)F	95		
	F5 7F			
104	40 7F		Count n rows	
	L0 3F			
105	36 1019L		Exit to Auxiliary II	
	22 80L		Repeat	
106	F5 5F			
	40 5F			
107	L0 4F		Count m columns	
	32 108L			
108	26 75L		Repeat	
	26 (p+2)F	5	Link	
109	00 1F			
	00 1F			
110	7L 4095F		1 - 2 ⁻³⁹	
	LL 4095F			
111	40 F			
	00 F		1/10	
112	S6 21L			
	41 (t)F	13		
113	N0 (t)F	14	End constants	
	L3 F			
114	J0 2F			
	40 (t)F	13'		

LOCATION	ORDER	NOTES	PAGE 28
	00 100K		
0	K5 F 42 87L		
1	41 4F L5 10S5		
2	40 7F 92 131F		
3	J0 37S9 50 3L		
4	26 S9 L5 0S5		
5	L4 10S5 42 12L		
6	42 72L 41 8F		
7	F5 10S5 00 20F		
8	46 11L 46 53L		
9	50 S3 50 9L		
10	26 S8 00 SK		
11	00 F 41 3F	Inverse - (N - K) + 1	
12	92 131F L5 F	(N - K) + S 3	
13	40 OF F5 3F		
14	40 3F L5 OF		
15	00 1F 36 13L		
16	L3 8F 36 19L		
17	L5 3F L4 11S5		

LOCATION	ORDER	NOTES	PAGE 29
18	LO 90L 40 3F		
19	41 6F L5 OS5		
20	42 21L 92 131F		
21	92 515F L5 F	S3	
22	40 OF 36 24L		
23	F1 12S5 22 24L		
24	41 1F 50 24L		
25	26 S6 F5 21L		To print out
26	42 21L F5 6F		
27	40 6F LO 7F		
28	32 20L F4 10L		
29	F4 10S5 40 10L		
30	F5 4F 40 4F		
31	LO 7S5 32 9L		
32	40 8E L7 8F		
33	32 35L 92 131F		
34	J0 40S9 50 34L		
35	26 S9 F5 8F		

LOCATION	ORDER	NOTES	PAGE 30
36	40 7F 15 4F		
37	10 285 32 9L		
38	41 1F F5 285		
39	40 OF 50 OF		
40	75 1085 85 F		
41	42 1F 15 1F		
42	14 48L 40 48L		
43	J0 4389 50 43L		
44	26 89 15 1385		
45	46 49L F5 485		
46	40 5F 41 6F		
47	50 2585 50 47L		
48	26 88 00 87		
49	00 F 15 89L		
50	40 52L 41 3F		
51	50 83 50 51L		
52	26 88 00 8K		
53	00 F 15 88L		

(N - K) + 1

LOCATION	ORDER	NOTES	PAGE 31
54	40 57L 41 4F		
55	41 1F 50 1F		
56	00 1F S5 S3		
57	50 F 74 F		
58	14 1F 40 1F		
59	LL 1F 36 68L		
60	L1 9S5 40 OF		
61	L5 56L 42 62L		
62	42 63L L5 F		
63	10 1F 40 F		
64	F5 63L 42 63L		
65	42 62L F5 OF		
66	40 OF L0 10S5		
67	32 62L 22 53L		
68	L5 57L 14 5S5		
69	40 57L F5 4F		
70	40 4F L0 10S5		
71	32 56L S5 OF		

LOCATION	ORDER	NOTES	PAGE 32
72	40 OF L5 F		(K - K) + S3
73	40 2F F5 3F		
74	40 3F L5 2F		
75	00 1F 36 73L		
76	92 131F 92 515F		
77	L5 1F 50 77L		
78	26 S6 F5 52L		
79	F4 10S5 L4 4S5		
80	40 52L F5 6F		
81	40 6F L0 5F		
82	32 50L L4 48L		
83	F4 2S5 40 48L		
84	F5 5F 40 5F		
85	92 131F 92 515F		
86	L5 6F L0 7S5		
87	32 46L 22 F		Link
88	50 S3 74 25S3		
89	26 S8 00 SK		

LOCATION	ORDER		NOTES
90	00 F 00 39F 00 996K		
0	L3 F 34 66F		SUM check
1	FF F 24 66F		
2	K8 2164F 86 3859F 26 L 26 LN		