

UNIVERSITY OF ILLINOIS  
DIGITAL COMPUTER

AUXILIARY LIBRARY ROUTINE M 33 - 299

**TITLE:** Drum Routine for Linear Programming by the Simplex  
Method-Modified for Variable  $C_j$   
**TYPE:** Complete Floating Point Program  
**DESCRIPTION:** All directions for use are the same as for the Williams  
Memory Routine M 32 - 298 except that the parameter  
tape is prepared as follows:

005+  
00F 00jF  
00F 00iF  
00F 00tF  
00kF 00bF  
24 999N

where  $j$ ,  $i$ ,  $t$ ,  $k$ , and  $b$  are defined as in M 32 - 298.

**CAPACITY:** Drum Storage  $(j + 1)(i + 1) \leq 10,240$   
Williams Memory Storage  $4i + 2(j + 1) \leq 663$

**TIMING:** The computational procedure is the same as for M 29 - 295,  
so a comparable amount of time will be required per  
iteration. However, there will in general be more itera-  
tions. The time required to change the  $C_k$  is negligible.

**EXAMPLE:** The example given in M 32 - 298 write-up is treated in  
the same way except the parameter tape is

005+  
00F 005F  
00F 002F  
00F 001F  
003F 000F  
24999N

The output has the form:

+250000000	+01	C <sub>3</sub>
006	+200000000	+01
007	+400000000	+01
+540000000	+06	Z
001	+359979000	+06
002	+449976000	+06
003	+179997500	+06
004	-900000000	+05
005	-900000000	+05
002	+100000000	+01
007	+100000000	+01
+900240002	+05	Z
001	+134991000	+06
006	-224988000	+06
003	-449904999	+05
004	+134988000	+06
005	-900000000	+05
002	+666666666	+00
001	+666666668	+00
+300000000	+02	Z
007	-899940000	+05
006	-899970000	+05
003	+649999999	+01
004	-299999999	+01
005	-600000000	+01
003	+100000000	+01
001	+100000000	+01
+235000000	+02	Z
007	-899907500	+05
006	-900067500	+05
002	-975000002	+01

004 +675000000 +01  
005 -925000001 +01  
003 +400000000 +01  
004 +200000000 +01  
+100000000 +02 Z

007 -899975000 +05  
006 -900000000 +05  
002 -165000000 +02  
001 -135000000 +02  
005 -250000000 +01  
+650000000 +01 C<sub>3</sub>

003 +400000000 +01  
004 +200000000 +01  
+260000000 +02 Z

007 -899935000 +05  
006 -900000000 +05  
002 -449999999 +01  
001 -149999999 +01  
005 -650000000 +01  
+105000000 +02 C<sub>3</sub>

003 +400000000 +01  
004 +200000000 +01  
+420000001 +02 Z

007 -899895000 +05  
006 -900000000 +05  
002 +750000004 +01  
001 +105000000 +02  
005 -105000000 +02  
003 +100000000 +01  
001 +100000000 +01  
+315000000 +02 Z

007 -899947500 +05  
006 -899947500 +05  
002 +225000002 +01  
004 -525000001 +01  
005 -524999999 +01  
  
002 +666666667 +00  
001 +666666667 +00  
+300000000 +02

Z

007 -899940000 +05  
006 -899970000 +05  
003 -150000001 +01  
004 -300000000 +01  
005 -600000000 +01

DATE	<u>May 27, 1960</u>
CODED BY	<u>L. Isaacson</u>
WRITE-UP BY	<u>Richard Hacker</u>
APPROVED BY	<u>J. Snyder</u>

LOCATION	ORDER	NOTES PAGE 1 M 33
	DOI Routine X 1	
	003K	
0	00 F	
	00 3F	
1	00 F	
	00 21F	
	0010K	
0	00 F	
	00 396F	
	0014K	
0	00 F	
	00 189F	
1	00 F	
	00 2560F	
2	00 F	
	00 356F	
	00 21K	
0	00 59F	
	10 166L	
1	10 124L	
	40 2L	
2	50 F	
	S5 20F	
3	40 2F	
	32 150L	
4	46 6L	
	10 12F	
5	14 125L	
	46 9L	
6	L5 F	
	10 1F	
7	40 F	
	10 6F	

LOCATION	ORDER	NOTES
8	01 7F 40 1F	
9	26 F 40 F	
10	L5 1S3 L0 1F	
11	50 F 32 15L	
12	40 2F S5 F	
13	50 S3 40 S3	
14	L5 1F 40 1S3	
15	L1 2F L4 125L	
16	42 17L L0 126L	
17	36 29L 7J F	
18	L4 S3 40 S3	
19	LL S3 36 27L	
20	50 S3 7J 32L	
21	40 S3 L5 43L	
22	L4 1S3 40 1S3	
23	26 27L 50 S3	
24	75 127L 00 4F	

LOCATION	ORDER	NOTES PAGE 3 M 33
25	40 S3 L1 43L	
26	L4 1S3 40 1S3	
27	L3 S3 36 68L	
28	L4 42L 32 23L	
29	L5 2L 36 1L	
30	L4 128L 22 1L	
31	7L 4095F LL 4095F	
32	00 F 00 1000 0000 0000 J	
33	00 F 00 1000 0000 000 J	
34	00 F 00 1000 0000 00 J	
35	00 F 00 1000 0000 0 J	
36	00 F 00 1000 0000 J	
37	00 F 00 1000 000 J	
38	00 F 00 1000 00 J	
39	00 F 00 1000 0 J	
40	00 F 00 1000 J	
41	00 F 00 64F	

LOCATION	ORDER	NOTES PAGE 4 M 33
42	00 F 00 4999 9999 998 J	
43	00 F 00 1F	
44	L1 F 22 9L	
45	L1 F 26 67L	
46	L5 131L 26 133L	
47	L5 131L 22 133L	
48	J0 1021F 26 10L	
49	L5 F 26 67L	
50	L1 1F 26 63L	
51	L0 41L 26 60L	
52	49 1F 22 77L	
53	L5 6L 22 97L	
54	41 1F 26 138L	
55	L5 6L 26 69L	
56	L7 S3 26 76L	
57	L5 2F 22 5L	
58	92 131F 26 95L	
59	L5 6L 22 149L	



LOCATION	ORDER	NOTES
60	L4 1S3	
	40 1S3	
61	50 F	
	7J S3	
62	00 1F	
	22 18L	
63	L4 130L	
	L4 1S3	
64	40 1S3	
	50 42L	
65	75 S3	
	66 F	
66	S5 31L	
	22 18L	
67	40 S3	
	L5 1F	
68	40 1S3	
	26 29L	
69	46 75L	
	L5 1S3	
70	32 71L	
	41 S3	
71	41 1S3	
	L0 167L	
72	34 72L	
	L5 S3	
73	10 6F	
	50 1F	
74	00 7F	
	L4 1S3	
75	40 F	
	26 29L	
76	40 S3	
	L3 F	
77	22 9L	
	81 4F	

LOCATION	ORDER	NOTES	PAGE 6	M 33
78	00 39F 36 80L			
79	L1 1F 40 1F			
80	27 84L 50 1F			
81	7J 32L 40 1F			
82	50 1F 75 2F			
83	00 39F L4 S3			
84	40 S3 81 4F			
85	40 2F L0 129L			
86	36 87L 22 80L			
87	81 4F 40 F			
88	81 4F 50 F			
89	74 129L L1 2F			
90	L4 129L 36 92L			
91	S1 31L 22 92L			
92	S5 F L4 41L			
93	40 1S3 26 19L			
94	L1 F 50 4F			
95	L5 2F 10 20F			

LOCATION	ORDER	NOTES
96	42 94L	
	47 94L	
97	26 29L	
	L4 91L	
98	46 105L	
	L5 94L	
99	L0 79L	
	36 101L	
100	92 963F	
	22 122L	
101	46 94L	
	L5 S3	
102	40 F	
	36 104L	
103	92 708F	
	22 104L	
104	92 644F	
	50 101L	
105	7J F	
	L6 F	
106	L6 F	
	32 110L	
107	L5 43L	
	L4 1S3	
108	40 1S3	
	L5 42L	
109	40 S3	
	40 F	
110	22 104L	
	10 39F	
111	75 129L	
	00 36F	
112	82 4F	
	10 40F	
113	L5 6L	
	L0 49L	

LOCATION	ORDER	NOTES	PAGE 8	M 33
114	46 6L L0 62L			
115	36 111L 92 961F			
116	L1 48L 40 48L			
117	32 118L 92 961F			
118	26 29L 46 6L			
119	L5 1S3 L0 41L			
120	40 F 50 F			
121	75 33L 00 38F			
122	26 102L 92 513F			
123	00 24F 26 101L			
124	5S F S5 F			
125	00 172L 00 31L			
126	00 172L 00 42L			
127	50 F 00 F			
128	5S 1F S5 F			
129	00 F 00 10F			
130	00 F 00 65F			
131	50 F S5 20F			

LOCATION	ORDER	NOTES
132	00 1F	
	00 1F	
133	L0 124L	
	40 1F	
134	L5 2F	
	46 1F	
135	32 143L	
	L5 S3	
136	36 137L	
	26 29L	
137	L5 1F	
	22 1L	
138	L5 2F	
	36 146L	
139	46 1F	
	50 1F	
140	75 33L	
	00 18F	
141	40 S3	
	L5 130L	
142	L4 43L	
	40 1S3	
143	26 19L	
	L5 157L	
144	L4 132L	
	40 157L	
145	00 28F	
	26 136L	
146	10 20F	
	42 1F	
147	L1 1F	
	50 158L	
148	L4 157L	
	40 157L	
149	26 29L	
	46 157L	

LOCATION	ORDER	NOTES	PAGE 10	M 33
150	26 29L			
	50 2F			
151	01 3F			
	L4 147L			
152	42 143L			
	42 155L			
153	42 148L			
	42 149L			
154	42 144L			
	J0 166L			
155	11 3F			
	L5 157L			
156	S4 F			
	26 4L			
157	80 F			
	00 2048F			
158	80 F			
	00 F			
159	80 F			
	00 F			
160	80 F			
	00 F			
161	80 F			
	00 F			
162	80 F			
	00 F			
163	80 F			
	00 F			
164	80 F			
	00 F			
165	80 F			
	00 F			
166	LL 4094F			
	4K 4076F			
167	00 F			
	00 128F			
	24999N			

LOCATION	ORDER	NOTES
0	001000K 81 8F 26 1005F	
0	00189K F5 5F L4 6F	
1	40 9F L5 10F	
2	L4 6F 40 13F	
3	L4 6F 40 19F	
4	F4 5F 40 20F	
5	L4 6F 40 11F	
6	F4 5F 40 12F	
7	L4 6F 40 17F	
8	L5 15F F4 6F	
9	40 18F 50 11L	
10	26 999F 00 F	
11	00 F 00 L	
12	00 F 26 L 261N	
13	L1 6F L0 5F	
14	40 8L 41 S13	

LOCATION	ORDER	NOTES	PAGE 12	M 33
15	F5 S13 40 1S13			
16	F5 8L 40 8L			
17	36 9L L5 2L			
18	L4 7L 40 2L			
19	26 2L 00 F			
20	00 1F 00 1F			
21	00 F 00 F			
22	50 10L 26 999F			
23	00 F 00 L			
24	00 F 26 L 261N			
25	41 9F 50 L			
26	26 S04 OK 1S05			
27	1K S06 88 F			
28	1S SOK 12 2L			
29	8J 56L 03 2L			
30	2K S09 88 F			
31	2S S0S 22 5L			



LOCATION	ORDER	NOTES PAGE 13 M 33
32	8J 136L 8S 11F	
33	OK S05 8J 61L	
34	1K S06 8K F	
35	8S 10F 15 SOK	
36	17 SON 84 10F	
37	8S 10F 12 10L	
38	81 10F 04 1S0S	
39	0S S11 80 11F	
40	83 17L 05 S11	
41	8S 11F 8J 66L	
42	8J 68L 02 8L	
43	85 11F 82 155L	
44	8J 92L 8J 70L	
45	3K S06 85 129L	
46	3N SOJ 83 28L	
47	31 SOJ 83 28L	
48	31 SOK 36 SOJ	

LOCATION	ORDER	NOTES
49	8S 10F	PAGE 14 M 33
	84 127L	
50	82 26L	
	81 10F	
51	83 28L	
	81 10F	
52	8S 127L	
	8J 80L	
53	8J 68L	
	32 20L	
54	85 127L	
	80 126L	
55	82 67L	
	8J 82L	
56	4K S06	
	8K F	
57	4S SOK	
	43 32L	
58	8K 1F	
	8S F	
59	8J 87L	
	5K 1S05	
60	8J 61L	
	6K S06	
61	85 F	
	86 F	
62	8S 17F	
	61 SOJ	
63	87 17F	
	64 SOK	
64	6S SOK	
	62 37L	
65	85 17F	
	8S F	

LOCATION	ORDER	NOTES
66	8J 56L	
	53 35L	
67	8J 106L	
	2K S06	
68	8F 1F	
	8J 70L	
69	8J 52L	
	25 SOK	
70	89 9F	
	23 44L	
71	2K S06	
	8K F	
72	8S 11F	
	25 SOK	
73	27 SON	
	84 11F	
74	8S 11F	
	22 47L	
75	8F 1F	
	85 11F	
76	89 9F	
	8J 130L	
77	92 131F	
	L5 S14	
78	00 28F	
	82 12F	
79	92 963F	
	F5 52L	
80	42 52L	
	26 29S04	
81	J0 SOK	
	50 56L	
82	26 S10	
	00 SOL	

LOCATION	ORDER	NOTES PAGE 16 M 33
83	00 S06 L5 57L	
84	F4 6F 40 57L	
85	26 29S04 8J 99L	
86	50 S0K 50 61L	
87	26 S10 00 S12	
88	00 S06 L5 62L	
89	F4 6F 40 62L	
90	26 29S04 00 98L	
91	F5 9F 40 18F	
92	26 29S04 8J 102L	
93	F5 9F 40 9F	
94	26 29S04 00 S0K	
95	50 S0K 50 70L	
96	26 S10 00 S0L	
97	00 S06 50 128L	
98	75 18F L5 15F	
99	S4 F L4 125L	
100	40 77L 40 90L	

LOCATION	ORDER	NOTES PAGE 17 M 33
101	50 SOJ 50 76L	
102	26 S10 00 F	
103	00 S06 41 9F	
104	26 29S04 00 F	
105	15 9F 40 16F	
106	26 29S04 00 SOS	
107	15 69L 14 16F	
108	42 33L 42 40L	
109	00 20F 46 36L	
110	15 13F 14 16F	
111	42 36L 26 29S04	
112	15 71L 40 57L	
113	40 62L 26 89L	
114	J0 S0K 50 89L	
115	26 S10 00 F	
116	00 S06 26 29S04	
117	26 29S04 00 F	
118	36 94L 26 29S04	

LOCATION	ORDER	NOTES
119	L1 7F	
	40 8F	
120	L5 124L	
	40 72L	
121	41 S03	
	50 96L	
122	26 S04	
	82 42L	
123	0F F	
	00 F	
124	L5 65L	
	42 135L	
125	26 95L	
	00 1S13	
126	26 S10	
	00 S12	
127	FF F	
	00 S14	
128	L5 123L	
	40 72L	
129	41 S03	
	50 104L	
130	26 S04	
	82 19L	
131	L5 101L	
	40 62L	
132	L5 126L	
	40 127L	
133	L5 81L	
	L4 18F	
134	42 112L	
	42 113L	
135	L5 12F	
	L4 16F	
136	42 114L	
	00 20F	

LOCATION	ORDER	NOTES PAGE 19 M 33
137	46 113L	
	50 F	
138	L5 F	
	40 F	
139	S5 F	
	40 F	
140	L1 1L	
	40 1L	
141	32 119L	
	L5 19F	
142	L4 18F	
	42 112L	
143	42 113L	
	L5 20F	
144	22 110L	
	41 9F	
145	L5 102L	
	42 52L	
146	41 S03	
	50 121L	
147	26 S04	
	82 7L	
148	00 S06	
	50 128L	
149	00 S06	
	26 29S04	
150	26 S10	
	00 F	
151	40 F	
	00 127F	
152	40 F	
	00 127F	
153	00 F	
	00 1S06	

LOCATION	ORDER	NOTES
154	ON 3276F NN 3255F	
155	L5 100L 42 52L	
156	92 131F 50 131L	
157	26 S04 2K S05	
158	8F 1F 8J 52L	
159	21 S11 89 9F	
160	22 133L 8J 103L	
161	92 135F 50 136L	
162	26 S04 88 F	
163	8S 166L 88 F	
164	8S 164L 85 F	
165	89 9F 8J 121L	
166	92 143F 92 515F	
167	L5 19F 42 144L	
168	41 F L5 157L	
169	42 F L5 F	
170	L0 F 40 1F	
171	L3 1F 32 148L	



LOCATION	ORDER	NOTES PAGE 21 M 33
172	F5 144L 42 144L	
173	22 144L L5 144L	
174	L0 19F L4 81L	
175	42 152L 42 153L	
176	22 151L 50 151L	
177	26 S04 85 F	
178	<del>84</del> 166L 8S F	
179	8S 165L 89 9F	
180	8J 162L 85 165L	
181	80 164L 82 60L	
182	8J 158L 00 F	
183	L5 159L 42 105L	
184	26 94L 00 163L	
185	L5 161L 42 105L	
186	26 141L 00 19L	
187	L5 101L 40 62L	
188	22 119L 8J 160L	

LOCATION	ORDER	NOTES PAGE 22 M 33
	00356K	
0	L5 8F	
	10 20F	
1	42 157SOF	
	L4 11F	
2	42 139SOF	
	47 8F	
3	L1 8F	
	36 6L	
4	L5 10L	
	40 13SOF	
5	L5 12L	
	40 134SOF	
6	L1 7F	
	36 9L	
7	40 8F	
	L5 11L	
8	40 92SOF	
	26 9L	
9	50 13L	
	26 999F	
10	85 10F	
	00 1SOS	
11	F5 8F	
	40 8F	
12	25 S11	
	89 9F	
13	00 F	
	00 L	
14	00 F	
	26 L	
	261N	
15	K5 F	
	42 9L	
16	42 33L	
	F4 21L	

LOCATION	ORDER	NOTES PAGE 23 M 33
17	42 3L	
	42 31L	
18	41 F	
	L5 F	
19	10 20F	
	FO 21L	
20	S4 F	
	42 35L	
21	42 36L	
	42 37L	
22	S5 F	
	32 32L	
23	42 10L	
	42 16L	
24	L1 38L	
	L4 F	
25	40 11L	
	L5 F	
26	86 11F	
	00 F	
27	F5 11L	
	40 11L	
28	F5 10L	
	42 10L	
29	FO 35L	
	32 10L	
30	L5 11L	
	40 20L	
31	L7 F	
	L4 F	
32	40 F	
	F5 16L	
33	42 16L	
	FO 36L	
34	36 16L	
	F1 F	

LOCATION	ORDER	NOTES
35	86 11F 00 F	
36	23 31L 00 F	
37	85 11F 00 F	
38	32 23L 40 F	
39	16 F 40 F	
40	F5 22L 40 22L	
41	F5 23L 42 23L	
42	F0 37L 36 22L	
43	L5 22L 40 29L	
44	85 11F 00 F	
45	F4 F 40 F	
46	L3 F 32 F	
47	FF 16F 42 23L	
48	L1 39L L4 F	
49	40 22L 26 22L	
50	NO 11L L5 F	
51	77 F L4 F	
52	S2 23L 40 F	

LOCATION	ORDER	NOTES
53	9L 4085L 00 F	
54	KO 4085L 00 F  24 189N	