Title: Sorting Routine

Author: Lesa P. Mullaney

Abstract: This routine sorts randomly ordered information into ascending numerical order.

PROGRAM DESCRIPTION

Program Title: "Sorting Routine"

Author: Leea P. Mullaney

Purpose: To sort randomly ordered information into ascending numerical order. The sorting can be performed on whole words (located in consecutive locations) - or any part of a word. Also, groups of words (in consecutive locations) called messages may be sorted on any part of any word in the message.

Input: A list of words, or groups of words located anywhere in memory in consecutive locations.

Calling Sequence:

α -1	B	L(Code Word #1)
α	R	(L_0+20)
α +1	U	L_0
α +2	Code Word	#2
α +3	Code Word	#3

Code word #1 must contain the following information:
M (The number of messages) in hex at Q=15
M_1 (The location of the first word of the first message)- in hex at Q=29.
Thus if code word #1 is 0014j00, this means there are 14H or 20d messages and the first word of the first message is located in 0j00H or 1200d.

Code word #2 must contain the following information:
N at Q=15, N being the number of words in each message. $1 < N < 64$
Y at Q=29, where Y is the number of the message word on which the sort is to be made.
00040004 means each message contains 4 words and the sort is to be performed on the first word of each message.

Code word #3 must contain a mask, with binary 1's in those bits on which the sort is to be performed. Thus a 7wwwwwwQ would mean sort on bits 1 through 30, and 00w00w00 would mean sort on bits 8-11 and 20-23. The mask may not contain a "1" in the sign bit since there is no provision in the sorting routine for sorting on the sign bit.

Output: The specified list of messages, in ascending numerical order according to the conditions specified. The first word of the re-ordered list will be in the same location as the first word of the original list.

Storage: 6 tracks including 2 tracks of temporary storage. The program requires 4 tracks. L_0+0400 and L_0+0500 must be reserved for temporary storage.

Capacity: Since the sorting routine is set up so that the list of messages is only stored once, the number of messages that can be handled is limited only by the memory capacity.

Time: One second per word on small samples

Examples of Code Words:

No. 1

To sort one "message" consisting of N words, the programmer may consider that he has N messages, one word in length. Thus, to sort one message of 37 words, stored in locations 4900 - 4936, sorting on bits 15 through 30 inclusive, the code words would read:

code word 1	0025 3100	37 messages, the first word of the first message located in 4900_d
code word 2	0001 0004	1 word per message, sort on first word.
code word 3	0001 WWWQ	Sort on bits 15 - 30 inclusive.

No. 2

code word 1	008 2000	8 messages, the first word of the first message located in 3200_d
code word 2	0004 0008	4 words per message, sort on 2nd word
code word 3	OWWO W800	Sort on bits 4 - 11 and 16 - 20, inclusive.

Input/Output of Example Code Words

EXAMPLE 1

LOCATION	INITIAL	SORTED
4900	0wj00004'	kf000002'
4901	q0000010'	0wj00004'
4902	00jj0018'	0w000006'
4903	0kqw0026'	0fg00008'
4904	00qj001j'	0k00000f'
4905	7wqj002f'	0w00000j'
4906	0fg00008'	0q00000q'
4907	0w000030'	q0000010'
4908	0k00000f'	0k000012'
4909	0q00003j'	00000014'
4910	0g000032'	0j000016'
4911	0w00000j'	00jj0018'
4912	0q00003w'	0f00001f'
4913	0f00001f'	00qj001j'
4914	qj0000j'	0000001q'
4915	00000014'	qk000020'
4916	w000012j'	0k000022'
4917	0w000006'	0j000024'
4918	0q00000q'	0k000028'
4919	qk000020'	7wqj002f'
4920	3j000064'	0w000030'
4921	fg000190'	0g000032'
4922	kf000002'	0q000034'
4923	0k000012'	00000036'
4924	00000036'	0q000038'
4925	0k000022'	0g00003f'
4926	0j000016'	0q00003j'
4927	0q000038'	qj00003j'
4928	0w000258'	0q00003q'
4929	0f00003w'	0f00003q'
4930	0j000024'	3j000064'
4931	0000001w'	0f0000j8'
4932	0g0000f'	w000012j'
4933	0f0000j8'	fg000190'
4934	0q000034'	0w0001w2'
4935	0k000028'	0w000258'
4936	0w0001w2'	0kqw0026'

Input/Output of Example Code Words

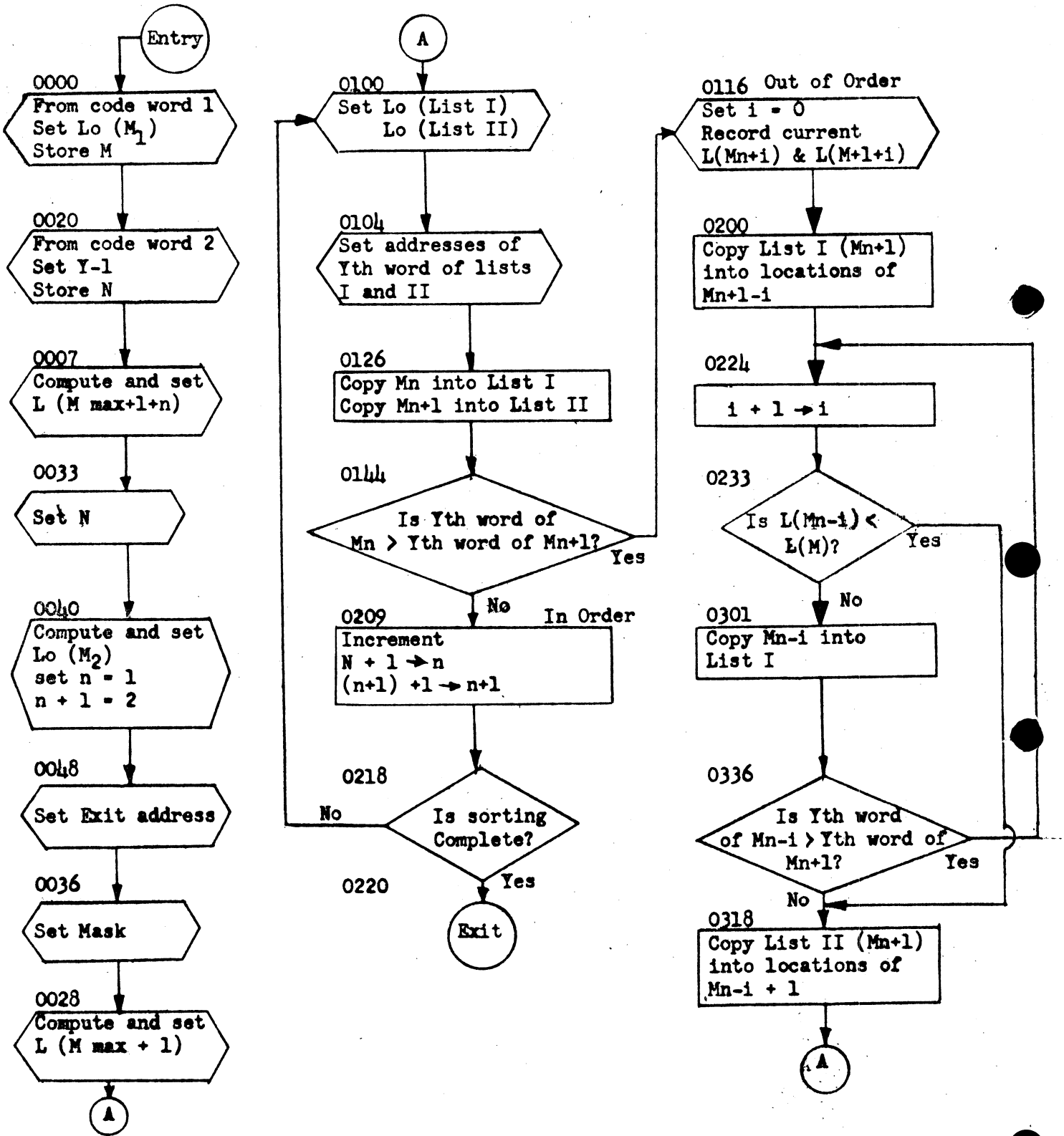
EXAMPLE 2

LOCATION	INITIAL	SORTED
3200	c3c403j0'	0c0803j0'
3201	c2q05000'	0c0[illegible]'
3202	c0001000'	000f0000'
3203	0c[illegible]'	01c0c800'
3204	04[illegible]'	010j02c0'
3205	03[illegible]'	01607000'
3206	0004[illegible]'	0fg09800'
3207	02q0w800'	0cjc80j0'
3208	03[illegible]'	04040[illegible]'
3209	02[illegible]'	01[illegible]'
3210	03g00000'	0cj0q000'
3211	0010j0w0'	000qq000'
3212	0404036c0'	0004036j0'
3213	0160q000'	02g0j000'
3214	00j0q000'	0001000'
3215	000qq000'	0cg00004'
3216	0404036j0'	030j03g0'
3217	03q0f800'	0[illegible]'
3218	0ww0w800'	03g00000'
3219	0q801000'	0010j0w0'
3220	090w03j0'	0404036j0'
3221	03g0f800'	03g0f800'
3222	016j8000'	0ww0w800'
3223	03g0f800'	0q801000'
3224	010j03j0'	090w03j0'
3225	01607000'	03g0f800'
3226	0fg09800'	016j8000'
3227	00j060j0'	03g0f800'
3228	0f0803j0'	0404003f'
3229	0080f800'	03g0q800'
3230	000f0800'	00048000'
3231	01606800'	02q0w800'

SORTING ROUTINE FLOW CHART

PROGRAM No. L1-49
May 26, 1960

m = no. of messages
Mn = nth message
Y = number of word within message on which sort is to be made
N = number of words per message



PREPARED FOR: LGP-30 USERS' ORGANIZATION - POOL | PAGE 1 OF 8

JOB NO. | PROGRAM NO. L1-49 | PROGRAM PREPARED BY: Leca P. Mullaney | PROGRAM CHECKED BY: POOL Review | DATE | TRACK

PROBLEM: Sorting Routine

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION OPERATION	INSTRUCTION ADDRESS	STOP	CONTENTS OF ADDRESS	NOTES
;0000 Lo	'						
/0000 Lo	'	☒					
		0000	H	0350	'	Temp A=M @15	$1_o M_1$ @ 29
		01	U	0019	'		
		02	H	0138	'	AA	set AA
		03	U	0048	'	☒	
		04	Y	0054	'	Y-1 @ 29	set Y-1 @ 29
		05	H	0055	'	Temp B=N @ 15	
		06	U	0007	'		
		07	M	0350	'	☒ M @ 15	=MN @ 30 = total no. of words
		08	N	0058	'	1 @ 30	=MN @ 29
		09	U	0026	'		
,0000 0002	'	10		4	'	1@ 29	
		11	WWW	0004	'	☒ -1@ 11 +	1@ 29 .
		12	Y	0162	'	N @ 29	set N @ 29
		13	Y	0163	'	N @ 29	set N @ 29
		14	Y	0143	'	N @ 29	set N @ 29
		15	N	0023	'	☒ 1 @ 13	=N @ 11
		16	S	0059	·	1@ 11	= N-1@ 11
		17	U	0040	'		
		18			'		
		19	Y	0205	'	☒ $1_o(M_1)$	set $1_o(M_1)$
		20	B	0000	'	code word 2	= N @ 15, Y @ 29
		21	S	0307	'	1@ 29	= N @ 15, Y-1@ 29
		22	U	0004	'		
,0000 0003	'	23	4	0000	'	☒ 1@ 13	
		24			'		
		23	1	0000	'	1@ 15	
		26	A	0205	'	$1_o(M_1)$	= $1_o(M_{max}+1)$ + N
		27	U	0032	'	☒	
		28	B	0204	'	$1_o(M_{max}+1 + N)$	
		29	S	0143	'	N @ 29	= $1_o(M_{max}+1)$
		30	Y	0204	'	$1_o(M_{max}+1)$	set $M_{max}+1$
		31	U	0100	·	☒	→ beginning

FORM LP-14V

PRINTED IN U.S.A.

☒ CARRIAGE RETURN

· = CONDITIONAL STOP CODE

PREPARED FOR: LGP-30 USERS' ORGANIZATION - POOL

PAGE 2/8

JOB NO.

PROGRAM NO. L1-49

PROGRAM PREPARED BY: Leea P. Mullaney

PROGRAM CHECKED BY: POOL Review

DATE

PROBLEM: Sorting Routine

TRACK

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION OPERATION	INSTRUCTION ADDRESS	STOP	CONTENTS OF ADDRESS	NOTES
	'						
	'	☒					
		0092	Y	0204	'	1_0(max + 1)	
		33	B	0055	'	Temp B	= N@ 29
		34	M	0056	'	1@ 14	= N@ 29
		35	U	0012	'	☒	
		36	B	0000	'	code word 3	= Mask
		37	U	0038	'		
		38	H	0203	'	Mask	set Mask
		39	U	0042	'	☒	
		40	A	0205	'	$1_0(M_1)$	= 1_0 (M_2)
		41	U	0002	'		
		42	C	0207	'	Mask	set Mask
		43	U	0028	'	☒	
,0000 0004	'	44			'		
		45		100	'	1 @ 23	
		46		3www	'		
		47		3www	'	☒	
		48	B	0020	•	Lo + 20	
		49	A	0307	'	1@ 29	= 1(code word 3)
		50	Y	0036	'	→ EQ	
		51	A	0309	'	☒ 1@ 29	=loc of exit
		52	Y	0220	'	Exit	set exit
		53	U	0036	'		
,0000 0010	'	54	[	]	'		Y=1@ 29
		55	[	]	'	☒ Temp B	
		56		20000	'	1@ 14	
		57			'		
		58		2	'	1@ 30	
		59		100000	'	☒ 1@ 11	
		60	[	]	'	XX	
		61			'		
		62		4	'	1 @ 29	
		63	[	]	•	☒ YY	

Royal McBee Corporation
DATA PROCESSING DIV.
PORT CHESTER, NEW YORK

ROYAL McBEE, J13541X

FORM LP-14V

PRINTED IN U.S.A.

☒ CARRIAGE RETURN

• = CONDITIONAL STOP CODE

PREPARED FOR: LGP-30 USERS' ORGANIZATION - POOL | PAGE 3/8

JOB NO. | PROGRAM NO. L1-49 | PROGRAM PREPARED BY: Lesa P. Mullaney | PROGRAM CHECKED BY: POOL Review | DATE

PROBLEM: Sorting Routine | TRACK

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION OPERATION	INSTRUCTION ADDRESS	STOP	CONTENTS OF ADDRESS	NOTES
	/						
	/	☒					
		0100	B	0115	/	lo (list I)	
		01	Y	0130	/	→ AA"	
		02	A	0045	/	1 @ 23	= lo(list II)
		03	Y	0139	/	☒ → AB"	
		04	A	0054	/	Y-1 @ 29	lo(Yth word of list II)
		05	Y	0155	/	→ BC	
		06	S	0221	/	1 @ 23	lo(Yth word of list I)
		07	Y	0336	/	☒ → BE	
		08	Y	0144	/	→ BB	
		09	B	0138	/	AA	lo(Mn)
		10	A	0025	/	1 @ 15	
		11	H	0126	/	☒ AA'	
		12	A	0162	/	N @ 29	lo(Mn + 1)
		13	C	0135	/	AB'	
		14	U	0126	/		→ AA'
		15	Z	0400	/	☒	lo list I
		16	B	0138	•	AA	Here for out of order
		17	H	0060	/	→ XX	
		18	U	0119	/		
		19	A	0162	/	☒ N @ 29	
		20	H	0063	/	→ YY	AF
		21	A	0300	/	C @ 15	
		22	C	0201	/	→ AS	
		23	B	0252	/	☒ lo(list I)	
		24	Y	0303	/	HE'	
		25	U	0128	/		
		26	B	0000	/	[Mn]	AA'
		27	U	0130	/	☒	
		28	Y	0200	/	AS'	
		29	U	0259	/		
		30	C	0000	/	list I	AA"
		31	U	0135	•	☒	

☒ CARRIAGE RETURN

• = CONDITIONAL STOP CODE

PREPARED FOR: LGP-30 USERS' ORGANIZATION

PAGE 4/8

JOB NO.

PROGRAM NO. L1-49

PROGRAMMED BY: Lees & Mullaney

CODE CHECKED BY: ACL Review

DATE

TRACK

PROBLEM: **Sorting Routine**

PROGRAM INPUT CODES	STOP	LOCATION	OPERATION	ADDRESS	NOTES
	/				
	/				
		0 1			Temp 2
			AD		
				[M n+1]	AB'
,0 0 0 0 0 0 0 2,	'				
					AA
					AB"
				AA'	
				1) + 1 @ 29	
				K @ 29	
				1, Y th word	BB
				mask	
				AA'	
				@ 29	
				AB'	
					→ BB
				AA"	
				@ 29	
					Temp 1
				II, Y th word	BC
				mask	
				1 @ 23	
,0 0 0 0 0 0 2	'			K @ 29	
				1 @ 29	

ROYAL MCBEE J13541X

FORM LP-14V

PRINTED IN U.S.A.

CARRIAGE RETURN

• = CONDITIONAL STOP CODE

Royal McBee Corporation
DATA PROCESSING DIV.
PORT CHESTER, NEW YORK

PREPARED FOR:

LGP-30 USERS' ORGANIZATION

PAGE 5 OF 8

JOB NO.	PROGRAM NO.	PROGRAM PREPARED BY	DATE
	L1-49	Lesa P. Mallory [illegible] Rorder	

TRACK

PROBLEM:

Sorting Routine

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION OPERATION	INSTRUCTION ADDRESS	COMMENTS SYMBOLS	NOTES
	/					
	/	☒				
		0200	[illegible]			AS'
		01	C	[illegible]	[illegible]	AS'
		02	U	0222		
,000006	/	03	[illegible]			Mask
		04	[illegible]			lo (M max + 1)
		05	[illegible]			lo (M1)
		06	WWW	0002		-M@ 11 + 1@ 29
		07	[illegible]			Mask
		08				
		09	B	0213	[illegible]	Increment here
		10	U	0218		
		11				
		12	A	0[illegible]	[illegible]	
		13	U	0[illegible]		
		14				
		15				
		16	B	0[illegible]	[illegible]	
		17	S	0[illegible]	[illegible]	
		18	S	0[illegible]	[illegible]	lo (S max + 1)
		19	T	0[illegible]		-> beginning
		20	U	0[illegible]	[illegible]	
		21	XZ	0[illegible]		1@ 23
		22	B	0[illegible]	[illegible]	
		23	U	0[illegible]		[illegible] for lines 1
		24	B	0[illegible]		
		25	U	0[illegible]		
		26	S	0[illegible]	[illegible]	1@ 29
		27	U	0231	/ ☒	
		28	B	0200	/	AS'
		29	S	0[illegible]	/	1@ 29
		30	U	[illegible]		
		31	H	0[illegible]		STOP

Royal McBee Corporation
DATA PROCESSING DIV.
PORT CHESTER, NEW YORK

FORM LP-14V

PRINTED IN U.S.A.

☒ = CONDITIONAL RETURN

• = CONDITIONAL STOP CODE

ROYAL McBEE J13641X

PREPARED FOR: LGP-30 USERS' ORGANIZATION - POOL

PAGE 6 / 8

JOB NO. | PROGRAM NO. L1-49 | PROGRAMMED BY: Lee F. [illegible] | PROGRAM CHECKED BY: POOL Review | DATE | TRACK

PROBLEM: Sorting Routine

PROGRAM INPUT CODES	STOP	LOCATION (INSTRUCTION)	CONTENTS (ADDRESS)	NOTES
	/			
	/			
		0 2		
			AC	
			XX	
			1@15	
			-1@11 + 1@29	
				→ finis number 1
			-1@11 + 1@29	
			AD	
				→ Increment
				Lo (list I)
			Temp 2	
			Temp 1	
				→ out of order
				→ Increment
			1@23	
			AD'	
			AS'	
,0000003				
				c@15

Royal McBee Corporation
DATA PROCESSING DIV.
PORT CHESTER, NEW YORK

FORM LP-14V

PRINTED IN U.S.A.

ROYAL McBEE J13541X

= CARRIAGE RETURN

= CONDITIONAL STOP CODE

PREPARED FOR: LGP-30 USERS' ORGANIZATION - POOL

PAGE 7 / 8

JOB NO. | PROGRAM NO. L1-49 | PROGRAM PREPARED BY: Leea P. Mullaney | PROGRAM CHECKED BY: POOL Review | DATE | TRACK

PROBLEM: Sorting Routine

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION OPERATION	INSTRUCTION ADDRESS	STOP	CONTENTS OF ADDRESS	NOTES
	/				/		
	/	☒			/		
		0300	K	0000	/		C@15
		01	B	0000	/	Mn-1	AE
		02	U	0303	/		
		03	C	0000	/	☒ List I	AE'
		04	U	0315	/		
,0000005	'	05	[	]	/		Temp 1
		06			/		
		07		4	/	☒	1@29
		08		4	/		1@29
		09		4	/		1@29
		10	B	0060	/	XX	AG
		11	U	0312	/	☒	
		12	A	0162	/	N@29	
		13	A	0263	/	C@15	
		14	U	0333	/		
		15	B	0301	/	☒ AE	
		16	A	0352	.	-1@11 + 1@29	
		17	U	0322	/		
		18	B	0000	/	List II	AD'
		19	C	0000	/	☒ [Mn]	AD
		20	U	0133	/		
		21			/		
		22	H	0301	/	AE	
		23	T	0336	/	☒	→ finis number 2
		24	B	0303	/		
		25	A	0062	/		
		26	U	0331	/		
		27	B	0063	/	☒ YY	
		28	S	0143	/	N@29	
		29	U	0120	/		→ AF
		30			/		
		31	C	0303	.	☒	

☒ CARRIAGE RETURN

. = CONDITIONAL STOP CODE

PREPARED FOR: LGP-30 USERS' ORGANIZATION - POOL

PAGE 8 / 18

JOB NO. | PROGRAM NO. L1-49 | PROGRAM PREPARED BY: Leea P. Mullaney | PROGRAM CHECKED BY: POOL Review | DATE | TRACK

PROBLEM: Sorting Routine

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION OPERATION	INSTRUCTION ADDRESS	CONTENTS OF ADDRESS	NOTES
	/					
	/					
		0332	U	0301		→ AE
		33	C	0319	→ AD	
		34	U	0318	→ AD'	
		35				Here for finis 2
		36	B	0000	list I yth word	
		37	U	0338		
		38	E	0203	Mask	
		39	U	0340		
		40	C	0305	Temp 1	
		41	U	0352		
,0000 0004	'	42				
		43				
		44				
		45				
		46	B	0318	AD	
		47	U	0359		
,0000 0005	'	48				
		49				
		50	[	]		Temp A
		51				
		52	WWW0	0001		-1@11 + 1@29
		53	B	0132	Temp 2	
		54	S	0305	Temp 1	
		55	T	0327		
		56	U	0310	→ AC	
		57				
		58				
		59	A	0019	1 29	
		60	H	0318	→ AD'	
		61	U	0318	→ AD'	
		62				
		63				

Royal McBee Corporation
DATA PROCESSING DIV.
PORT CHESTER, NEW YORK

FORM LP-14V

PRINTED IN U.S.A.

ROYAL McBEE J13541X

CARRIAGE RETURN

* = CONDITIONAL STOP CODE