

DIAGNOSTIC PROGRAM MANUAL  
SIGMA 5 AND 7  
CPU FORMAT CONVERTER/  
CPU LOADER DOCUMENTATION  
PROGRAM NO. 704029A

November 1968

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1      ****
2      ****
3      * PROGRAM OBJECTIVES: (1) CONVERT SIGMA 5/7 METASYMBOL BINARY OUTPUT
4      * DECKS INTO FORMATTED BINARY DECKS WHICH
5      * INCLUDE A LOAD ROUTINE.
6      *
7      * (2) PROVIDE DOCUMENTATION FOR THE LOAD ROUTINE.
8      *
9      ****
10     ****
11     * PROGRAM DESCRIPTION: LOAD ROUTINE
12     *
13     *
14     ****
15     * THE FIVE CARD LOADER SERVES A DUAL PURPOSE. NORMALLY IT WILL UTILIZE
16     * DATA CHAINING TO POSITION THE DATA ON EACH CARD INTO THE PROPER
17     * MEMORY LOCATIONS. IF THE FIRST CARD OF THE LOADER IS BYPASSED THEN
18     * THE NEXT FOUR CARDS WILL CONSTITUTE A CHECKSUMMING LOADER THAT USES
19     * A COMMON BUFFER AREA (22 THROUGH 3F).
20     ****

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21     PAGE
22     ****
23     * THE FORMAT OF A DATA CARD IS AS FOLLOWS:
24     * WORD (0-29)  HEX CHAR (0-7)  CONTENT  FUNCTION
25     * 0           0                C        INDICATES DATA CARD
26     * 0           1-5              VARIABLE  BYTE ADDRESS OF DATA
27     * 0           6-7              SC        BYTE COUNT (ALWAYS=5C)
28     * 1-23        0-7              VARIABLE  DATA TO BE LOADED
29     * 24          0-7              17       WORD COUNT
30     * 25          0-7              VARIABLE  WORD ADDRESS
31     * 26          0-7              VARIABLE  CHECKSUM
32     * 27          0-7              VARIABLE  PROGRAM REVISION-
33     * 28          0-3              VARIABLE  LEVEL
34     * 28          4-7              VARIABLE  SEQUENCE NUMBER
35     * 29          0-7              VARIABLE  SEQUENCE NUMBER
36     * END CARD FORMAT :
37     * WORD 0  HEX CHAR 0 = 4  END CARD INDICATOR
38     * WORD 0  HEX CHAR 1-5 = A8  BYTE ADDR
39     * WORD 0  HEX CHAR 6-7 = 4  BYTE COUNT
40     * WORD 1  HEX CHAR 0-7 = 680NNNNN = NNNNN IS THE ADDRESS FOR STARTING
41     * EXECUTION OF THE PROGRAM.
42     * WORD 26  DECK CHECKSUM
43     * WORD 24-25  UNCHANGED FROM LAST DATA CARD
44     * WORD 27-29  SAME MEANING AS A DATA CARD.
45     ***
46     ****
47     * CONVERSION ROUTINE
48     *
49     * THE CONVERSION ROUTINE LOADS THE OBJECT PROGRAM, PRODUCES A LOADER,
50     * SEQUENCED DATA CARDS AND AN END CARD.

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50 PAGE  
 51 \*\*\*\*\*  
 52 \*\*\*\*\*  
 53 \* OPERATING REQUIREMENTS AND SPECIFICATIONS  
 54 \* LOAD ROUTINE CONVERSION ROUTINE  
 55 \*  
 56 \* REQUIRED EQUIPMENT- SIGMA 5-7 CPU SIGMA 5-7 CPU, CARD  
 57 \* CARD OR PAPER TAPE RDR READER AND PUNCH  
 58 \* OPTIONAL EQUIPMENT- NONE NONE  
 59 \* PROGRAM PREREQUISITES- NONE SUCCESSFUL DIAGNOSTICS  
 60 \* CORE STORAGE- 8K MINIMUM 16K MINIMUM  
 61 \* RUN TIME- DEPENDS ON PROGRAM SIZE DEPENDS ON PROG SIZE  
 62 \* PROGRAM MEDIA- CARD OR PAPER TAPE CARDS ONLY  
 63 \* SOURCE LANGUAGE- METASYMBOL METASYMBOL  
 64 \*\*\*\*\*  
 65 \*\*\*\*\*  
 66 \*\*\*\*\*  
 67 \* OPERATING PROCEDURES: LOAD ROUTINE  
 68 \*  
 69 \* THE FOLLOWING DETAILS OPERATOR ACTION AND PROGRAM FLOW FOR EACH MODE.  
 70 \*  
 71 \* NORMAL LOAD:  
 72 \* 1. CPU RESET  
 73 \* 2. SET THE UNIT ADDRESS SWITCHES TO SELECT THE INPUT  
 74 \* DEVICE ADDRESS.  
 75 \* 3. DEPRESS LOAD.  
 76 \* 4. PLACE THE COMPUTE SWITCH TO RUN.  
 77 \*  
 78 \*  
 79 \* FLOWCHART OF NORMAL LOAD

80 PAGE  
 81 \* I  
 82 \* I  
 83 \* V  
 84 \* I-----I  
 85 \* I THE FIRST CARD READS INTO LBCS I  
 86 \* I 2A THRU 3F I  
 87 \* I-----I  
 88 \* I  
 89 \* I<<<-----I  
 90 \* V I  
 91 \* I-----I  
 92 \* I LOAD RC WITH THE CDA FOR DBLWD1 I  
 93 \* I BRANCH TO THE SIE IN LBC 27 I  
 94 \* I-----I  
 95 \* I CDA = COMMAND DOUBLEWORD ADDRESS I  
 96 \* I DBLWD1 = DOUBLEWORD 1 I  
 97 \* I  
 98 \* V I  
 99 \* I-----I  
 100 \* I READ THE FIRST THREE BYTES FROM I  
 101 \* I THE NEXT CARD INTO THE BYTE ADDR I  
 102 \* I POSITION OF DBLWD3 I  
 103 \* I-----I  
 104 \* I  
 105 \* I  
 106 \* V I  
 107 \* I-----I  
 108 \* I DATA CHAIN TO READ THE NEXT I  
 109 \* I BYTE INTO THE BYTE COUNT AREA I  
 110 \* I OF DBLWD3 I  
 111 \* I-----I  
 112 \* I

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113                                     PAGE
114                                     I
115                                     V
116                                     I-----I
117                                     I DATA CHAIN TO DBLWD3 WHICH WILL I
118                                     I READ ALL BUT X'18' BYTES I
119                                     I-----I
120                                     I
121                                     I
122                                     V
123                                     I-----I
124                                     I DATA CHAIN TO DBLWD4 WHICH WILL I
125                                     I IGNORE THE REMAINING X'18' BYTES I
126                                     I BY LOADING THEM INTO LDCS 0-5. I
127                                     I (THIS ACTION IS NECESSARY FOR I
128                                     I PROPER POSITIONING OF PAPER TAPE I
129                                     I LOADING) I
130                                     I-----I
131                                     I
132                                     I
133                                     V
134                                     AAAAAAAAAAAAAAAAAA
135                                     A DID THE CARD A (NB)
136                                     A MODIFY LDC 2A A-----I
137                                     A
138                                     AAAAAAAAAAAAAAAAAA
139                                     I
140                                     I (YES)
141                                     I
142                                     V
143                                     I-----I
144                                     I THE BRANCH INSTRUCTION LOADED I
145                                     I INTO 2A TRANSFERS CONTROL TO I
146                                     I THE DIAGNOSTIC PROGRAM I
147                                     I-----I

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148                                     PAGE
149                                     ****
150                                     *
151                                     *
152                                     * CHECKSUM BAD:
153                                     *
154                                     * 1. CPU RESET
155                                     * 2. SET UNIT ADDRESS SWITCHES
156                                     * 3. DEPRESS LOAD
157                                     * 4. SINGLE STEP THREE TIMES CAUSING THE FIRST CARD
158                                     *    TO BE READ.
159                                     * 5. CPU RESET
160                                     * 6. COMPUTE SWITCH TO RUN.
161                                     *
162                                     *
163                                     *
164                                     *
165                                     *
166                                     *
167                                     *
168                                     *
169                                     *

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211                                     PAGE
212                                     *
213                                     ** CHECKSUM LOADER **
214 01 0002A                                L8C      X'12A'
01 0301E
215 01 0002A      2001005C A              AI,0    X'1005C'
216
217                                     *
218 01 0002H      2200001C                LI,0    DA(CDW1)
219 01 0002C      CC000025 A              SI8,0   *37
220 01 0002D      CC000025 A              TI8,0   *37
221 01 0002E      69C0002D                BCS,12  $-1
222 01 0002F      2200001D                LI,0    DA(CDW2)
223 01 00030      CC000025 A              SI8,0   *37
224 01 00031      CC000025 A              TI8,0   *37
225 01 00032      69C00031                BCS,12  $-1
226 01 00033      2200001E                LI,0    DA(CDW3)
227 01 00034      CC000025 A              SI8,0   *37
228 01 00035      CC000025 A              TI8,0   *37
229 01 00036      69C00035                BCS,12  $-1
230 01 00037      68001FA1                B       CARD
231 01 00038      02007E80 N CDW1          GEN,8,24,8,24 2,BA(CARD-1),12,120
0C000078
232 01 0003A      02007EF8 N CDW2          GEN,8,24,8,24 2,BA(NEXT1),12,120
0C000078
233 01 0003C      02007F70 N CDW3          GEN,8,24,8,24 2,BA(NEXT2),12,120
0C000078
234 01 0003E                                     RFS      10

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\*\*\*\* CARD 1 \*\*\*\*

DUMMY INSTRUCTION ALLOWS THJ CARD TO START LOADING INTO L8C 40 WHEN USING N0RMA7 L8AD.

L8AD CARD 2

L8AD CARD 3

L8AD CARD 4

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235                                     PAGE
236 01 01FA0                                L8C      X'1FA0'
01 0303C
237 01 01FA0      8001004C A              DATA   X'8001005C'
238
239 01 01FA1      2200000C A              * CARD  LI,0    0
240 01 01FA2      35001FE3                STW,0   T8TALSUM
241 01 01FA3      32000025 A              LW,0    X'25'
242 01 01FA4      3500000F A              STW,0   11
243 01 01FA5      220000F4                READ    LI,0    DA(READ8RD)
244 01 01FA6      CC000008 A              SI8,0   *11
245 01 01FA7      C0000008 A              TI8,0   *11
246 01 01FA8      69C01FA7                BCS,12  $-1
247 01 01FA9      32100022 A              LW,1    X'22'
248 01 01FAA      48101FF4                AND,1   W00T03
249 01 01FAB      31101FF5                CW,1    C8DE1
250 01 01FAC      69301FCC                BNE     ENDTEST
251 01 01FAD      221FFFF6 A              LI,1    -26
252 01 01FAE      222FFFFF A              LI,2    -1
253 01 01FAF      3120003C A              CW,2    X'3C'
254 01 01FB0      68301FB9                BF      M8VETEST
255 01 01FB1      2220000C A              LI,2    0
256 01 01FB2      3022003C A              AW,2    60,1
257 01 01FB3      65101FB2                BIR,1   $-1
258 01 01FB4      3120003C A              CW,2    X'3C'
259 01 01FB5      69301FB5                BNE     $
260 01 01FB6      32301FE3                LW,2    T8TALSUM
261 01 01FB7      30300002 A              AW,3    2
262 01 01FB8      35301FE3                STW,3   T8TALSUM
263 01 01FB9      32100038 A M8VETEST  LW,1    X'3B'
264 01 01FBA      68001FBF                B       NEXT1+1
265 01 01FBB                                     RES      3

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\*\*\*\* CARD 2 \*\*\*\*

ALL8WS THJ5 CARD TO BE SKIPPED BY THE N0RMA7 L8AD.

INITIALIZE DECK CHECK SUM

M8VE DEVICE ADDR TO SCRATHPAD

READ CARD INTO X'22' THRU X'3F'

L8BK AT C8DE IN 1ST HEX CHAR OF CARD N8T C8DE F8R DATA CARD

IGN8RE IF CARD CHECKSUM = -1  
IGN8RE CHECKSUM IF ALL BNE5 ON CARD

C8MPUTE CHECKSUM

C(2) SH8LD 8QUAL CHECKSUM IN X'3C'  
HANG UP IF CHECKSUM ERR8R

ADD TO CHECKSUM F8R X8BLE DECK

PICK UP L8AD ADDR

266				PAGE		
267	01	01FB	8001005C A	NEXT1	DATA	X'8001005C'
268	01	01FB	3A20003A A		LCH,2	X'3A'
269	01	01FC	21100040 A		CI,1	X'40'
270	01	01FC1	69101FDD		BL	BUFBL
271	01	01FC2	68001FC3		B	CARD3
272	01	01FC3	3010003A A	CARD3	AW,1	X'3A'
273	01	01FC4	21101FA0 A		CI,1	X'1FA0'
274	01	01FC5	68101FC5		RGE	*
275	01	01FC6	22300023 A		LI,3	X'23'
276	01	01FC7	3030003A A		AW,3	X'3A'
277	01	01FC8	B2440003 A		LW,4	*3,2
278	01	01FC9	B5440001 A		STW,4	*1,2
279	01	01FCA	65201FC8		BIR,2	*-2
280	01	01FCB	68001FA5		B	READ
281	01	01FCC	31101FE6	FNDTFST	CW,1	C0DE2
282	01	01FCD	69301FCD		BNE	*
283	01	01FCE	32100022 A		LW,1	X'22'
284	01	01FCF	30100023 A		AW,1	X'23'
285	01	01FDD	30101FE3		AW,1	TOTALSUM
286	01	01FD1	3110003C A		CW,1	X'3C'
287	01	01FD2	69301FD2		BNE	*
288	01	01FD3	68000023 A		B	X'23'
289	01	01FD4			RES	8

CARD 3 - ALLOW BYPASS

POSSIBLE OVERFLOW INTO BUFFER AREA

HANG UP IF LOADING OVER LOADER

RELOCATE DATA

TEST FOR END CARD CODE  
HANG UP IF INVALID CODE

VERIFY CHECKSUM FOR ENTIRE DECK  
HANG UP IF CHECKSUM ERROR  
ENTER PROGRAM

290				PAGE		
291	01	01FDC	8001005C A	NEXT?	DATA	X'8001005C'
292	01	01FDD	3010003A A	BUFBL	AW,1	X'3A'
293	01	01FDE	21100020 A		CI,1	X'20'
294	01	01FDF	68101FE1		BGE	*-2
295	01	01FE0	68001FC4		B	CARD3+1
296	01	01FE1	68001FE1		B	*
297	01	01FE2	68001FA5		B	READ
298	01	01FE3	00000000 A	TOTALSUM	PZE	
299	01	01FE4	F0000000 A	W00T03	DATA	X'F0000000'
300	01	01FE5	C0000000 A		CRDE1	X'C0000000'
301	01	01FE6	40000000 A		CRDE2	X'40000000'
302	01	01FE7	00000000 A		DATA	0
303	01	01FE8	02000088 A	READBRD	DATA	X'02000088'
304	01	01FE9	0C000078 A		DATA	X'0C000078'
305	01	01FEA			RES	16
306					SPACE	6

CARD 4  
TOP OF LOAD ADDR

CARD WILL OVERLAY THE LOADER AREA

TRYING TO LOAD INTO X'20' THRU X'3F'  
BYPASS CURRENT CARD

THIS CAUSES A DOUBLE WORD BOUNDARY

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307                                PAGE
308                                ****
309                                ****  CONVERSION ROUTINE
310                                *
311                                *
312 01 03300                        BRG      X'3300'
01 03300
313 01 03300  22000000 A  CALL  LI,0  0  RELOCATION BIAS
314 01 03301  6AB20004 A  BAL,11  4,1  CALL THE LOADER
315 * SAVE REVISION LEVEL. PUT INTO OUTPUT BUFFER AREA
316 01 03302  22600003 A  LI,6  3
317 01 03303  32CC003C A  LW,12  X'3C',6  FROM X'3D' THRU X'3F'
318 01 03304  35CC346A  STW,12  0UTBUF+26,6  TO 00TBUF 27 THRU 29
319 01 03305  64603303  BDR,6  $-2
320 * GET END CARD
321 01 03306  22001A47  RERFAD LI,0  DA(PARAM)  CDW FOR READING LAST CARD
322 01 03307  CC0033FC  SI,0  +CR
323 01 03308  CC0033FC  TI,0  +CR
324 01 03309  69C03308  BCS,12  $-1
325 01 0330A  6AB034AE  BAL,11  CONVER  FORM FIRST, LAST AND STARTING ADDR
326 01 0330B  6800330C  B  CYCLE+1
327 01 0330C  2F000000 A  CYCLE  WAIT  0  WAIT FOR R1, R2, AND R3 TO BE LOADED
328 01 0330D  31300001 A  CW,3  1  TEST R1
329 01 0330E  6910330C  BL  CYCLE  R2
330 01 0330F  31300002 A  CW,3  2  AND
331 01 03310  6920330C  BG  CYCLE  R3
332 01 03311  22000000 A  LI,0  0
333 01 03312  3500342C  STW,0  LCARD  INITIALIZE LAST CARD INDICATOR
334 01 03313  3500342D  STW,0  ECARD  INITIALIZE END CARD INDICATOR
335 01 03314  3500342A  STW,0  SW1  INITIALIZE SW1
336 01 03315  3500342B  STW,0  SW2  AND SW2
337 01 03316  35003431  STW,0  CHECKSUM
338 01 03317  3510000A A  STW,1  10  FIRST LOCATION TO PUNCH IN R10
    
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339                                PAGE
340 01 03318  22000001 A  LI,0  1
341 01 03319  350033B0  STW,0  CPF  INITIALIZE FIRST CARD INDICATOR
342 01 0331A  22000009 A  LI,0  9
343 01 0331B  3500341C  STW,0  UNIT  SET SEQUENCE NUMBER TO 9999
344 01 0331C  3500341D  STW,0  TEN  IT WILL INCREMENT TO 0000 FOR
345 01 0331D  3500341E  STW,0  HUN  THE FIRST CARD
346 01 0331E  3500341F  STW,0  THBU
347 *
348 *
349 01 0331F  22000003 A  LI,0  3
350 01 03320  6C000000 A  RD,0  0
351 01 03321  3500342A  STW,0  SW1
352 01 03322  68403324  BCR,4  $+2
353 01 03323  3500342B  STW,0  SW2  SAVE SS2
354 01 03324  22403000  LDR4  LI,4  LDR4IMG
355 01 03325  32F0342B  LW,15  SW2
356 01 03326  6930332C  BNEZ  LDR4TEST
357 01 03327  225FFFFB A  LI,5  -5  NUMBER OF CARDS IN LOADER
358 01 03328  354033AE  STW,4  CPBUF
359 01 03329  6AF033DC  BAL,15  PC-CARD
360 01 0332A  2040001E A  AI,4  30
361 01 0332B  65503328  BIR,5  $-3
362 01 0332C  68003337  B  SETUP
363 01 0332D  22603432  LDR4TEST LI,6  INBUF
364 01 0332E  3560340A  STW,6  CMLIST2
365 01 0332F  356033FR  STW,6  CRBUF
366 01 03330  225FFFFB A  LI,5  -5  NUMBER OF CARDS IN LOADER
367 01 03331  35403409  LDR4T1  STW,4  CMLIST1
368 01 03332  6AF033FE  BAL,15  READCARD  READ A LOADER CARD
369 01 03333  6AF0340F  BAL,15  CMLIST  TEST IT
370 01 03334  69303334  BNE  $
371 01 03335  2040001E A  AI,4  30
372 01 03336  65503331  BIR,5  LDR4T1
    
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				PAGE		
373						
374						
375						• SET UP THE CARD IMAGE TO PUNCH A DATA CARD OR END CARD
376						•
377	01	03337	2250345C	SETUP	LI,5	BUTBUF
378	01	03338	355033AE		STW,5	CPBUF
379	01	03339	35503409		STW,5	CMPLIST1
380	01	0333A	2270000A A		LI,7	10
381	01	0333B	225FFFFC A		LI,5	-4
382	01	0333C	331A342C	RVR	MTW,1	THRU+1,5
383	01	0333D	317A3420		CW,7	THRU+1,5
384	01	0333E	69303342		BNE	SEQ
385	01	0333F	22600000 A		LI,6	0
386	01	03340	356A342C		STW,6	THRU+1,5
387	01	03341	6550333C		BIR,5	BVR
388	01	03342	65503348	SFD	BIR,5	CHUN
389	01	03343	3270341F		LW,7	THBU
390	01	03344	2290FFFO A		LI,9	X'FFFF0'
391	01	03345	328E3420		LW,8	TABLE,7
392	01	03346	25800004 A		SLS,8	4
393	01	03347	4780346C		STS,8	BUTBUF+2R
394	01	03348	65503350	CHUN	BIR,5	CTEN
395	01	03349	3270341E		LW,7	HUN
396	01	0334A	328E3420		LW,8	TABLE,7
397	01	0334B	2290000F A		LI,9	15
398	01	0334C	25800278 A		SCS,8	-8
399	01	0334D	4780346C		STS,8	BUTBUF+28
400	01	0334E	3290350D		LW,9	'X'FFFF00000'
401	01	0334F	4780346D		STS,8	BUTBUF+29

				PAGE		
402						
403	01	03350	65503356	CTEN	BIR,5	CUNIT
404	01	03351	3270341D		LW,7	TEN
405	01	03352	328F342C		LW,8	TABLE,7
406	01	03353	3290350E		LI,9	'X'FFFF000'
407	01	03354	2580000C A		SLS,8	12
408	01	03355	4780346D		STS,8	BUTBUF+29
409	01	03356	3270341C	CUNIT	LW,7	UNIT
410	01	03357	328E3420		LW,8	TABLE,7
411	01	03358	22900FFF A		LI,9	X'FFFF'
412	01	03359	4780346D		STS,8	BUTBUF+29
413	01	0335A	225FFFFCA A		LI,5	-54
414	01	0335B	2240000C A		LI,4	0
415	01	0335C	354A3468		STW,4	INBUF+54,5
416						
417	01	0335D	6550335C		BIR,5	'*-1
418	01	0335E	3250342C		LW,5	LCARD
419	01	0335F	69303391		RNEZ	ENDCARD
420	01	03360	22C00017 A		LI,12	23
421	01	03361	32D00002 A		LW,13	2
422	01	03362	38D0000A A		SW,13	10
423	01	03363	20D00001 A		AI,13	1
424	01	03364	31D0000C A		CW,13	12
425	01	03365	69203367		BG	ZBACK
426	01	03366	3310342C		MTW,1	LCARD
427	01	03367	32F0000C A	ZBACK	LW,15	12
428	01	03368	25F00018 A		SLS,15	24
429	01	03369	49F0000A A		BR,15	10
430	01	0336A	25F0020A A		SCS,15	10
431	01	0336B	49F0342E		BR,15	CONT1
432	01	0336C	35F03450		STW,15	BUTBUF

GO IF TENS DOESN'T CHANGE

MASK  
MOVE OVER MASK

MASK

CLEAR INPUT AND OUTPUT BUFFER EXCEPT  
FOR ID AND SEQUENCELAST DATA CARD HAS BEEN PROCESSED  
WORD COUNTGET LAST ADDRESS  
CALCULATE NUMBER OF  
WORDS LEFTCOMPARE WORDS LEFT TO COUNT  
MORE THAN ONE CARD LEFT  
SET LAST-DATA-CARD INDICATORADDRESS INTO 15  
SHIFT AND POSITION AS BYTE CNT/ADR

433				PAGE		
434			*			
435	01	0336D	3A50000C A	LW,5	12	USE WORD COUNT FOR INDEX
436	01	0336E	22003451	LI,13	OUTBUF+1	
437	01	0336F	3300342A	MTW,0	SW1	TEST SW1
438	01	03370	68303373	BEZ	*+3	
439	01	03371	35C03468	STW,12	OUTBUF+24	WORD COUNT
440	01	03372	35A03469	STW,10	OUTBUF+25	WORD ADDR
441	01	03373	30D0000C A	AW,13	12	
442	01	03374	30A0000C A	AW,10	12	
443	01	03375	B2FA000A A	LW,15	*10,5	PICK UP DATA
444	01	03376	B5FA000D A	STW,15	*13,5	STORE DATA
445	01	03377	65503375	BIR,5	*-2	
446	01	03378	32F0342A	LW,15	SW1	TEST SW1
447	01	03379	68303382	BEZ	TESTSW2	RESET - NO CHECK SUM NEEDED
448	01	0337A	226FFFE6 A	LI,6	-26	INDEX FOR CHECKSUM
449	01	0337B	22F00000 A	LI,15	0	
450	01	0337C	30FC346A	AW,15	OUTBUF+26,6	GENERATE CHECKSUM
451	01	0337D	6560337C	BIR,6	*-1	
452	01	0337E	35F0346A	STW,15	OUTBUF+26	CHECKSUM TO IMAGE
453	01	0337F	31F0346E	CW,15	WOOT31	
454	01	03380	68303382	RE	TESTSW2	DO NOT ADD ALL-ONES CHECKSUM TO TOTL
455	01	03381	66F03431	AWM,15	CHECKSUM	CHECK SUM FOR LAST CARD
456	01	03382	32F0342B	LW,15	SW2	
457	01	03383	69303386	BNEZ	*+3	
458	01	03384	6AF033D0	BAL,15	PCHCARD	PUNCH
459	01	03385	68003389	B	*+4	OR
460	01	03386	6AF033FE	BAL,15	READCARD	READ AND
461	01	03387	6AF0340F	BAL,15	CMPLIST	TEST
462	01	03388	69303388	BNE	*	NO COMPARE
463	01	03389	32F0342D	LW,15	ECARD	TEST THE
464	01	0338A	68303337	BEZ	SETUP	END CARD INDICATOR

465				PAGE		
466						
467			*			
468						
469	01	0338B	32F0342B	LW,15	SW2	
470	01	0338C	6930330C	BNEZ	CYCLE	
471	01	0338D	22F0346F	LI,15	BLANKIMG	
472	01	0338E	35F033AE	STW,15	CPBUF	
473	01	0338F	6AF033D0	BAL,15	PCHCARD	
474	01	03390	6800330C	B	CYCLE	
475	01	03391	32F0342F	ENDCARD	LW,15	CONT2
476	01	03392	35F03450	STW,15	OUTBUF	
477	01	03393	32F00003 A	LW,15	3	PICK UP STARTING ADDRESS
478	01	03394	49F0343C	BR,15	BR8PCODE	
479	01	03395	35F03451	STW,15	OUTBUF+1	PUT BRANCH INSTRUCTION ON END CARD
480	01	03396	22F00001 A	LI,15	1	
481	01	03397	35F0342D	STW,15	ECARD	
482	01	03398	32F0342A	LW,15	SW1	
483	01	03399	68303382	BEZ	TESTSW2	
484	01	0339A	32F03431	LW,15	CHECKSUM	MAKE TOTAL
485	01	0339B	30F0345C	AW,15	OUTBUF	CHECK SUM
486	01	0339C	30F03451	AW,15	OUTBUF+1	FOR END
487	01	0339D	35F0346A	STW,15	OUTBUF+26	CARD
488	01	0339E	68003382	B	TESTSW2	

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506 01 033A0 00000000 A CPDW BBUND 8 PUNCH COMMAND DOUBLEWORD
507 01 033A1 28000078 A DATA 0 (COMMAND CHAIN)
508 01 033A2 080019D0 GEN,8,24 8,DA(CPDW) TRANSFER IN CHANNEL
509 01 033A3 00000000 A DATA 0
510 01 033A4 00000000 A DATA 0 STOP
511 01 033A5 00000000 A DATA 0
512 01 033A6 09000000 A CPBRD1 DATA X'09000000' ORDER FOR ALT STACKER ON ERROR
513 01 033A7 11000000 A CPBRD2 DATA X'11000000' ORDER FOR ALT STKR UNCONDITIONALLY
514 01 033A8 1100CEC8 CPDWC GEN,8,24 X'11',BA(CPERRBUF) COMMAND DOUBLEWORD FOR READ CHK ERR
515 01 033A9 28000078 A DATA X'28000078' (COMMAND CHAIN)
516 01 033AA 080019D4 GEN,8,24 8,DA(CPDWC) TRANSFER IN CHANNEL
517 01 033AB 00000000 A DATA 0
518 01 033AC 00000000 A DATA 0 STOP
519 01 033AD 00000000 A DATA 0
520 01 033AE 00000000 A CPBUF PZE 0 BUFFER ADDRESS
521 01 033AF 00000004 A CP PZE 4 DEVICE ADDRESS
522 01 033B0 00000001 A CPF DATA 1 FIRST CARD INDICATOR
523 01 033B1 00000000 A CPLINK PZE 0 RETURN LINK
524 01 033B2 CPERRBUF RES 30 RECOVERY BUFFER

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525
526 01 033D0 CF0033AF PCHCARD HI0,0 *CP
527 01 033D1 35F033R1 STW,15 CPLINK SAVE RETURN LINK
528 01 033D2 32F033AF LW,15 CPBUF PICK UP BUFFER ADDRESS
529 01 033D3 25F00002 A SLS,15 2 CONVERT TO BYTE ADDRESS
530 01 033D4 330033HC MTW,0 CPF
531 01 033D5 693033D8 RNE7 **3 FIRST CARD
532 01 033D6 49F033A6 BR,15 CPBRD1 SET ORDER FOR ALT STACKER ON ERROR
533 01 033D7 680033D9 R **2
534 01 033D8 49F033A7 BR,15 CPBRD2 SET ORDER FOR ALT STACKER ON ERRND.
535 01 033D9 35F033AC STW,15 CPDW INSERT IN COMMAND DOUBLEWORD
536 01 033DA 220019D0 LI,0 DA(CPDW)
537 01 033DB CC0033AF CPSIR SI0,0 *CP PUNCH A CARD
538 01 033DC 69C033DB RCS,12 *-1
539 01 033DD C0F033AF CPTIR TI0,15 *CP
540 01 033DE 688033F1 HCR,8 **3
541 01 033DF 684033DD BCR,4 *-2 STOP BUSY
542 01 033E0 2E000000 A WAIT 0 PUNCH WENT AWAY
543 01 033E1 25F00070 A SLS,15 -16
544 01 033E2 330033HC MTW,0 CPF
545 01 033E3 693033E6 RNEZ **3
546 01 033E4 21F0C840 A CI,15 X'0840'
547 01 033E5 694033F1 BCS,4 CPERRBR READ CHECK ERROR
548 01 033E6 21F06000 A CI,15 X'6000'
549 01 033E7 694033DD HCS,4 CPTIR BUSY
550 01 033E8 22F00000 A LI,15 0
551 01 033E9 35F033RC STW,15 CPF CLEAR FIRST CARD INDICATOR
552 01 033EA 22600000 A LI,6 0 INDEX

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553				PAGE			
554	01	033EB	B2FC33AE	CPMBVE	LW,15	*CPBUF,6	MOVE
555	01	033EC	35FC33R2		STW,15	CPERRBUF,6	DATA
556	01	033ED	20600001 A		AI,6	1	BUFFER
557	01	033EE	2160001E A		CI,6	30	FBR ERROR
558	01	033EF	691033EB		BL	CPMBVE	RECOVERY
559	01	033F0	E80033R1		B	*CPLINK	EXIT
560	01	033F1	CF0033AF	CPERR0R	HI0,0	*CP	
561	01	033F2	220019D4		LI,0	DA(CPDWC)	ATTEMPT
562	01	033F3	CC0033AF		SI0,0	*CP	ERROR
563	01	033F4	69C033F3		BCS,12	*-1	RECOVERY
564	01	033F5	CD0033AF		TI0,0	*CP	
565	01	033F6	69C033F5		BCS,12	*-1	
566	01	033F7	680033DA		B	CPSI0-1	

567				PAGE			
568							
569				*			
570				*	*** CARD READER SUBROUTINE ***		
571				*			
572				*	ONE CARD IS READ IN THE BINARY MODE. THIRTY WORDS ARE INPUT TO THE		
573				*	BUFFER AREA DESIGNATED BY THE ADDRESS IN CRBUF. THE PROGRAM		
574				*	ENTERS THE SUBROUTINE BY LOADING AN ADDRESS IN CRBUF AND THEN		
575				*	EXECUTING THE INSTRUCTION: BAL,15 READCARD. REGISTERS R0, AND		
576				*	R15 ARE VOLATILE.		
577				*			
578	01	033F8	00000000 A	CRDW	DATA	0	READ COMMAND DOUBLEWORD
579	01	033F9	08000078 A		DATA	X'08000078'	
580	01	033FA	02000000 A	CR0RD	DATA	X'02000000'	ORDER CODE
581	01	033FB	00000000 A	CRBUF	PZE	0	BUFFER ADDRESS
582	01	033FC	00000003 A	CR	PZE	3	DEVICE ADDRESS
583	01	033FD	00000000 A	CRLINK	PZE	0	RETURN LINK
584				*			
585				*			
586	01	033FE	35F033FD	READCARD	STW,15	CRLINK	SAVE RETURN LINK
587	01	033FF	32F033FB		LW,15	CRBUF	
588	01	03400	25F00002 A		SLS,15	2	CONVERT TO BYTE ADDRESS
589	01	03401	49F033FA		0R,15	CR0RD	INSERT READ ORDER
590	01	03402	35F033F8		STW,15	CRDW	MOVE TO COMMAND DOUBLEWORD
591	01	03403	220019FC		LI,0	DA(CRDW)	
592	01	03404	CC0033FC		SI0,0	*CR	READ A CARD
593	01	03405	69C03404		BCS,12	*-1	
594	01	03406	CD0033FC		TI0,0	*CR	
595	01	03407	69C03406		BCS,12	*-1	
596	01	03408	E80033FD		R	*CRLINK	EXIT

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610 01 03409 00000000 A CMLIST1 PZE
611 01 0340A 00000000 A CMLIST2 PZE
612 01 0340B 0000001E A CMPCNT DATA 30 THIRTY IF NOT SET OTHERWISE
613 01 0340C 00000000 A CMLP1 PZE
614 01 0340D 00000000 A CMLP2 PZE
615 01 0340E 00000000 A CMLINK PZE
616
617
618 01 0340F 35F0340E CMLIST STW,15 CMLINK SAVE RETURN LINK
619 01 03410 32F03409 LW,15 CMLIST1
620 01 03411 30F0340B AW,15 CMPCNT
621 01 03412 35F0340C STW,15 CMLP1 SET UP INDIRECT ADDRESS FOR 1ST LIST
622 01 03413 32F0340A LW,15 CMLIST2
623 01 03414 30F0340B AW,15 CMPCNT
624 01 03415 35F0340D STW,15 CMLP2 SET UP INDIRECT ADDRESS FOR 2ND LIST
625 01 03416 3A60340B LCW,6 CMPCNT INDEX
626 01 03417 B2FC340C LW,15 *CMLP1,6
627 01 03418 B1FC340D CW,15 *CMLP2,6 COMPARE TWO WORDS
628 01 03419 E930340E BNE *CMLINK NONCOMPARE EXIT
629 01 0341A 65603417 RIR,6 $-3
630 01 0341B EX00340F B *CMLINK SUCCESSFUL COMPARE EXIT
    
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635 01 0341C 00000009 A UNIT DATA 9
636 01 0341D 00000009 A TEN DATA 9
637 01 0341E 00000009 A HUN DATA 9
638 01 0341F 00000009 A THBU DATA 9
639 01 03420 00000200 A TABLE DATA 512,256,128,64,32,16,8,4,2,1
    01 03421 00000100 A
    01 03422 00000080 A
    01 03423 00000040 A
    01 03424 00000020 A
    01 03425 00000010 A
    01 03426 00000008 A
    01 03427 00000004 A
    01 03428 00000002 A
    01 03429 00000001 A
640 01 0342A 00000000 A SW1 DATA 0
641 01 0342B 00000000 A SW2 DATA 0
642 01 0342C 00000000 A LCARD DATA 0 LAST DATA CARD INDICATOR
643 01 0342D 00000000 A ECARD DATA 0 END CARD INDICATOR
644 01 0342E C0000000 A CBNT1 DATA X'00000000'
645 01 0342F 4000A804 A CBNT2 DATA X'4000A804'
646 01 03430 60000000 A BRBPCODE R 0
647 01 03431 00000000 A CHECKSUM DATA 0
648 01 03432 INBUF RES 30
649 01 03430 OUTBUF RES 30
650 01 0343E FFFFFFFF A ROOT31 DATA -1
    
```

651			PAGE	
652	01 0346F	00000000 A	BLANKING DATA	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
	01 03470	00000000 A		
	01 03471	00000000 A		
	01 03472	00000000 A		
	01 03473	00000000 A		
	01 03474	00000000 A		
	01 03475	00000000 A		
	01 03476	00000000 A		
	01 03477	00000000 A		
	01 03478	00000000 A		
	01 03479	00000000 A		
	01 0347A	00000000 A		
	01 0347B	00000000 A		
	01 0347C	00000000 A		
	01 0347D	00000000 A		
653	01 0347E	00000000 A	DATA	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
	01 0347F	00000000 A		
	01 03480	00000000 A		
	01 03481	00000000 A		
	01 03482	00000000 A		
	01 03483	00000000 A		
	01 03484	00000000 A		
	01 03485	00000000 A		
	01 03486	00000000 A		
	01 03487	00000000 A		
	01 03488	00000000 A		
	01 03489	00000000 A		
	01 0348A	00000000 A		
	01 0348B	00000000 A		
	01 0348C	00000000 A		

654			PAGE	
655				
656				
657	01 0348E	0600D240 N 0000004E	PARAM	BOUND 8 GEN,8,24,32 6,BA(PARCARD),7A
658	01 03490		PARCARD	RFS 30
659	01 034AE	35B034C8	C0NVFR	STW,11 SAFE RETURN ADDR
660	01 034AF	222FFF88 A		LI,2 -120 INDEX
661	01 034B0	721434AE	NEWBY	LB,1 PARCARD+30,2 GET FIRST CHAR - MUST BE F,S,OR L
662	01 034B1	211000D3 A		CI,1 X'03'
663	01 034B2	683C34C2		BE LFIELD
664	01 034B3	211000F2 A		CI,1 X'12'
665	01 034B4	683034R8		BE SFIELD CHECK FOR CONTROL CHAR = S
666	01 034B5	211000C6 A		CI,1 X'06'
667	01 034B6	683034C5		BE FFIELD
668	01 034B7	680034E6		B P00RF0RM
669	01 034B8	6ABC34CD	SFIELD	BAL,11 HEX CONVERT ADDR
670	01 034B9	35C034CB		STW,12 AFIELD+2 STARTING ADDR TO STORAGE
671	01 034BA	652034RB	RF	RIR,2 \$+1 NEXT BYTE
672	01 034BB	33F034CC		MTW,15 PR0CESS UPDATE NO. OF FIELDS PROCESSED
673	01 034BC	693034R0		RNEZ NEWBY OR IF < 3 HAVE BEEN PROCESSED
674	01 034BD	32B034C8		LW,11 SAFE RETURN ADDR
675	01 034BE	321C34C9		LW,1 AFIELD FIRST LBC IN HEX
676	01 034BF	322C34CA		LW,2 AFIELD+1 LAST LBC IN HEX
677	01 034C0	323034CB		LW,3 AFIELD+2 STARTING LBC IN HEX
678	01 034C1	E800000B A		B *11 RETURN
679	01 034C2	6AB034CD	LFIELD	BAL,11 HEX CONVERT ADDR
680	01 034C3	35C034CA		STW,12 AFIELD+1 LAST ADDR TO STORAGE
681	01 034C4	680034BA		B RF NEXT FIELD
682	01 034C5	6AB034CD	SFIELD	BAL,11 HEX CONVERT ADDR
683	01 034C6	35C034C9		STW,12 AFIELD FIRST ADDR TO STORAGE
684	01 034C7	680034BA		B RF NEXT FIELD

685				PAGE				
686	01	034C8	00000000	A	SAFE	DATA	0	
687	01	034C9			AFIELD	RES	3	
688	01	034CC	00000003	A	PROCESS	DATA	3	
689	01	034CD			HEX	RES	0	
690	01	034CD	22C00000	A		LI,12	0	
691	01	034CE	652034CF			BIR,2	*+1	NEXT BYTE ADDR
692	01	034CE	2290000F	A		LI,9	15	MASK
693	01	034D0	72E434AE			LB,14	PARCARD+30,2	
694	01	034D1	21E0006B	A		CI,14	X'6B'	SHOULD BE A COMMA
695	01	034D2	693034E6			BNE	P00RF0RM	COMMA LEFT OUT OF FORMAT
696	01	034D3	652034D4			BIR,2	*+1	NEXT BYTE
697	01	034D4	72E434AE		NHX	LB,14	PARCARD+30,2	
698	01	034D5	21E0006B	A		CI,14	X'6B'	
699	01	034D6	E930000B	A		BE	*11	FIELD IS COMPLETE - RETURN
700	01	034D7	21E00040	A		CI,14	X'40'	IS IT A SPACE
701	01	034D8	683034EC			BE	MAYERR	
702	01	034D9	25C00004	A		SLS,12	4	MOVE BY ONE HEX
703	01	034DA	22F000F0	A		LI,15	X'F0'	MASK FOR 0-9
704	01	034DB	45E0000F	A		CS,14	15	
705	01	034DC	693034E1			BNE	ALPHA	00 IF NOT 0-9
706	01	034DD	35E00008	A	NUM	STW,14	8	
707	01	034DE	4780000C	A		STS,8	12	FORM ADDR
708	01	034DF	652034D4			BIR,2	NHX	NEXT BYTE
709	01	034E0	680034F6			B	P00RF0RM	RAN OUT OF BYTES
710	01	034E1	22F000C0	A	ALPHA	LI,15	X'CO'	MASK FOR A-F
711	01	034E2	45E0000F	A		CS,14	15	
712	01	034E3	693034E6			BNE	P00RF0RM	NOT 0-9 OR A-F
713	01	034E4	20E00009	A		AI,14	9	CONVERT TO HEX NUM
714	01	034E5	680034DD			B	NUM	

715					PAGE			
716	01	034E6			P00RF0RM	RES	0	
717	01	034E6	22700003	A		LI,7	3	
718	01	034E7	357034CC			STW,7	PROCESS	
719	01	034E8	22001A79			LI,0	DA(ERRMSG)	
720	01	034E9	4C000001	A		SIB,0	1	TO KSR
721	01	034EA	2E000000	A		WAIT		
722					* FORMAT	ERROR	PUT NEW CARD IN READER AND CLEAR THE WAIT	
723	01	034EB	68003306		B	REREAD	READ NEW CARD	
724	01	034EC	32E034CC		MAYERR	LW,14	PROCESS	
725	01	034ED	21E00001	A		CI,14	1	
726	01	034EE	693034E6			BNE	P00RF0RM	FORMAT ERROR
727	01	034EF	32C0000C	A		LW,12	12	D0ES R12 HAVE AN ADDR
728	01	034F0	683034E6			BEZ	P00RF0RM	FORMAT ERROR
729	01	034F1	E800000B	A		B	*11	RETURN
730					BOUND		8	

731				PAGE	
732	01 034F2	0500D3D0 N	ERRMSG	GEN,8,24,32 5,BA(ERM),(BA(ERMEND)-BA(ERM))	
		00000064			
733			ERM	TEXT	'N FORMAT CARD IN ERROR, SHOULD BE AS FOLLOWS:',
734					'NF,XXX,L,XXX,S,XXX,':
735	01 034F4	1540C6D6 A			'N XXX MAY BE FROM 1 TO 5 CHARACTERS'
	01 034F5	D9D4C1E3 A			
	01 034F6	40C3C1D9 A			
	01 034F7	C440C9D5 A			
	01 034F8	40C5D9D9 A			
	01 034F9	D6D96B40 A			
	01 034FA	E2C8D6E4 A			
	01 034FB	D3C440C2 A			
	01 034FC	C540C1E2 A			
	01 034FD	40C6D6D3 A			
	01 034FE	D3D6E6F2 A			
	01 034FF	7A15C66B A			
	01 03500	E7E7E76B A			
	01 03501	D36BE7F7 A			
	01 03502	E76BE26B A			
	01 03503	E7E7E76B A			
	01 03504	154040F7 A			
	01 03505	E7E740D4 A			
	01 03506	C1E840C2 A			
	01 03507	C540C6D9 A			
	01 03508	D6D440F1 A			
	01 03509	40E3D640 A			
	01 0350A	F540C3C8 A			
	01 0350B	C1D9C1C3 A			
	01 0350C	E3C5D9F2 A			
736	01 0350D		ERMEND	RES	C
737	01 0350E	03300	END	END	CALL
	01 0350D	FF000000 A			
	01 0350E	00FF0000 A			





# READER SURVEY

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- CLEARLY EXPLAINED ?
- WELL ILLUSTRATED ?
- WELL ORGANIZED ?
- OTHER \_\_\_\_\_

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- OPERATOR
- PROGRAMMER
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COMMENTS: \_\_\_\_\_

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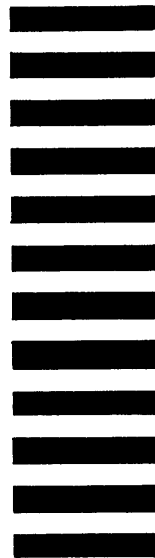
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