

IDENTIFICATION

Product Code: Maindec 08-D1GB-D

Product Name: PDP-8, 8I, 8S Extended Memory Control

Date Created: May 5, 1968

Maintainer: Diagnostics Group

1. Abstract

This program tests the Extended Memory Control logic for proper operation. It may be used with a PDP-8, 8I, or 8S equipped with a minimum of 4K of extended memory. The program exercises and tests the control IOT's; the ability to reference all fields from field 0; program interrupt and interrupt inhibit; auto-indexing in each field, and a special test for the PDP-8I which tests the presence of a false memory pulse when a non-existent memory field is referenced.

Errors encountered during running will result in a program halt. The halt locations are labeled, and the error may be identified by referencing the program listing or table of error halts.

2. Requirements

2.1 Equipment

A standard PDP-8, 8I or 8S equipped with an Extended Memory Control, and at least 4K of extended memory.

2.2 Storage

The program requires 1726(8) locations of code memory. The program must reside in memory field 0 only.

2.3 Preliminary Programs

All programs for a basic PDP-8, 8I or 8S must have been previously run successfully.

3. Loading Procedure

3.1 Method

The program must be loaded with the Binary loader.

- a. Turn off the Teletype reader.
- b. Set the SWITCH REGISTER to 7777.
- c. Press LOAD ADDRESS, and then START.
- d. Place the program tape in the reader and turn on the reader.
- e. When the program has been loaded, stop the computer, turn off the reader, and remove the tape.

4. Starting Procedure

4.1 Starting Addresses

The starting address is 0200(8).

4.2 Control Switch Settings

SR 8 must be on a 1 if a PDP-8I is being used. Otherwise, on a 0 for a PDP-8 or 8S.

SR 9, 10 and 11 must contain an octal value equal to the number of EXTENDED memory fields available (1 to 7 octal). Note that field 0 is not to be included in this value.

4.3 Operator Action

With the program in memory, set the SWITCH REGISTER to 0200 octal.

Press LOAD ADDRESS.

Set SR 8 to a 1 if a PDP-8I is being used. Otherwise, set SR 8 to a 0.

Place the octal number of EXTENDED memory fields available in SR 9, 10 and 11. This value may vary from 1 to 7 only.

Press START.

The program will run until an error is detected, or stopped by the operator.

The TTY bell is rung once after one complete pass of the program.

5. Operating Procedure

See section 4.2

5.2 Subroutine Abstracts

Refer to the program listing for descriptions of each test, and the method of testing.

5.3 Operator Action

See section 4.3

6. Errors6.1 Error Halts and Description

Table of Error Halts

<u>C (MA)</u>	<u>Tag</u>	<u>Description</u>
<u>CDF and RDF Tests</u>		
206	E 1	CDF 0 or RDF failed.
217	E 2	CDF 7 or RDF failed.
234	E 3	CDF 1 or RDF failed.
245	E 4	CDF 2 or RDF failed.
262	E 5	CDF 3 or RDF failed.
273	E 6	CDF 4 or RDF failed.
310	E 7	CDF 5 or RDF failed.
321	E 8	CDF 6 or RDF failed.
<u>DF, IB and SF Tests</u>		
341	E 9	RIB or ION failed.
351	E 10	DF not cleared, or no interrupt.
360	E 11	RIB or SF failed. (DF 1)
410	E 12	DF not cleared, or no interrupt.
417	E 13	RIB or SF failed. (DF 2)
427	E 14	DF not cleared, or no interrupt.
436	E 15	RIB or SF failed. (DF 3)
452	E 16	DF not cleared, or no interrupt.
462 461	E 17	RIB or SF failed. (DF 4)

471	E 18	DF not cleared or no interrupt.
500	E 19	RIB or SF failed. (DF 5)
514	E 20	DF not cleared, or no interrupt.
523	E 21	RIB or SF failed. (DF 6)
533	E 22	DF not cleared, or no interrupt.
542	E 23	RIB or SF failed. (DF 7)

DCA I and TAD I Tests

653	E 24	DCA I or TAD I to an extended field failed. The DF indicators equal the current field under test. The AC contains the data as read from location 7000 of the extended field. The halt occurred due to the data read and the current data field not being equal. Each extended field should contain its field number in location 7000.
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CIF, IB and SF Tests

Program interrupt is enabled for these tests. A CIF is issued, followed by an ION and a JMP. The IF should always equal 0, because of the interrupt occurring after the JMP instruction. A HLT is in location 1 of each intended field in case the IF does get set. The TTY flag is used for interrupts.

710	E 25	No interrupt, or inhibit interrupt failed.
717	E 26	CIF 1. The IB or SF failed. The AC = C(IB).
733	E 27	No interrupt or inhibit interrupt failed.
742	E 28	CIF 2. The IB or SF failed. The AC = C(IB).
756	E 29	No interrupt or inhibit interrupt failed.
765	E 30	CIF 3. The IB or SF failed. The AC = C(IB).
1004	E 31 31	No interrupt, or inhibit interrupt failed.
1013	E 32	CIF 4. The IB or SF failed. The AC = C(IB).

1027	E 33	No interrupt, or inhibit interrupt failed.
1036	E 34	CIF 5. The IB or SF failed. The AC = C(IB).
1052	E 35	No interrupt, or inhibit interrupt failed.
1061	E 36	CIF 6. The IB or SF failed. The AC = C(IB).
1075	E 37	No interrupt, or inhibit interrupt failed.
1104	E 38	CIF 7. The IB or SF failed. The AC = C(IB).

Interrupt Inhibit Test

A subroutine is placed in each extended field to ensure that program interrupt is inhibited after a CIF IOT, and is enabled after a JMP instruction. The routine is in one field at a time; the contents of all other extended fields will equal 0000. The routine is described on the program listing as the "Extended Field Test Routine," and is tagged EXFLD.

The test routine is entered at location 1174 in the extended field. This location contains a CIF XX IOT, where XX equals the extended field number. Location 1175 contains an ION IOT. Locations 1176 to 7776 contain all 0's. Location 7777 contains a JMP I 12. The routine, therefore, issues a CIF, ION, and JMP I 12 sequence. Program interrupt should be inhibited until after the JMP I 12 at location 7777. An error halt occurs in field 0 if an interrupt occurs between locations 1176 and 7777. Location 12 contains 1175 (E 40 in field 0), and will auto-index to 1176.

1175	E 40	CIF or interrupt failed. The DF and IF should equal an extended field.
1203	E 41	The DF was not cleared after the interrupt. All other functions worked properly.
1221	E 42	RMF or SF failed. The SF register should have saved the extended field number after interrupt. The AC = C(I.B.) after an RMF.
1235	E 43	All functions worked, but the PC did not equal location E 40 + 1 after the interrupt in the extended field failed. The AC = contents of location 0, field 0.
4	E 44	Location 4 in the extended field. The interrupt went to this field instead of field 0, or the JMP I 12 at location 7777 was not executed. Also,

make sure interrupt was enabled in location 1175 in the extended field.

10	E 45	Location 10 in the extended field. The JMP 1 12 at location 7777 was not executed, or interrupt failed.
1422 1420	E 45A	No program interrupt occurred. Press CONTINUE to try again. try
7000	-	Memory field 1 halt. An interrupt in field 0 was followed by a CIF 10 IOT, and then an RMF. The RMF should have restored the IB to field 0. The SF and IB were OR'd together, resulting in the IF being set to field 1, after the JMP instruction at location 1430. Restart from 1400 to repeat the test.

Auto-Index Test

The subroutine labeled "Auto-Index Test" on the listing is placed in each extended field. Auto-index registers 10 through 17 in each field are tested. All of memory not occupied by the subroutine is set to 0. The error halts tagged E 46 through E 53 will occur in the extended field if an auto-index register fails. The DF and IF indicators will display the current field being tested.

1524 1522	E 46	Index register 10 failed.
1527 1525	E 47	Index register 11 failed.
1532 1530	E 48	Index register 12 failed.
1535 1533	E 49	Index register 13 failed.
1540 1536	E 50	Index register 14 failed.
1543 1541	E 51	Index register 15 failed.
1546 1544	E 52	Index register 16 failed.
1551 1547	E 53	Index register 17 failed.

Non-Existent Memory Test

This is the last test performed, and is included for PDP-8I's only. The test makes sure that a false memory done pulse is generated when the DF is set to a non-existent memory field. If the PDP-8I being used is equipped with the maximum of 32 K of

code memory, the program automatically skips this test and restarts at location 200. SR 8 on a 0 will cause the program to always skip this test.

The test also makes certain that the correct data is deposited in the AC when a non-existent field is referenced. This data must always equal 0000 or 7777 octal, depending on the number of extended fields existing. For example, if the PDP-8I is equipped with fields 0, 1, 2 and 3, any reference with a TAD I to fields 4 through 7 should result with 7777 octal in the AC. If equipped with fields 0, 1 and 2, a TAD I to field 3 should result with 0000 octal in the AC, and referencing 4 through 7 will result with 7777 octal in the AC. In other words, referencing the lowest order non-existent field, when the total number available is odd, will result with 0000 in the AC. Referencing all other non-existent fields will result with 7777 in the AC. When the total number available is even, referencing any non-existent field will result with 7777 in the AC.

The only legal halts in this test, are at locations 1700 and 1725. If the computer halts at any other location, the false memory done pulse probably was not generated.

The false memory done pulse is not generated when a CIF to a non-existent field is attempted.

1700	E 54	All 0's should have been deposited in the AC, or an existing field was referenced. Make sure the proper value is in SR 9-11. The number of <u>extended fields available</u> must be in <u>SR 9-11</u> .
1725	E 57	All 1's should have been deposited in the AC, or an existing field was referenced. Make sure the proper value is in SR 9-11.

6.2 Error Recovery

Press CONTINUE to repeat the failing test. Place a NOP in the error halt location to loop on a failing test. Restart from 1400 after a halt at 7000 in field 1.

7. Restrictions

7.1 Starting Restrictions

None

7.2 Operating Restrictions

The number of extended memory fields available must be in SR 9-11 before starting from location 200.

8. Miscellaneous

8.1 Execution Time

Running time is dependent on the amount of extended memory for testing, and on whether the processor being used is a PDP-8, 8I or 8S. The TTY bell will ring once for each pass of the program.

9. Program Description

The program exercises all IOT's associated with the Extended Memory Control logic, plus the ability to reference extended fields from field 0, and vice-versa. Each test is looped 4096 times before initiating the next test. A switch option is provided to skip or execute a non-existent memory test for the PDP-8I.

The individual test routines and error halts are commented on the program listing as an aid to trouble-shooting. Section 6 contains a Table of Error Halts which also may be referenced.

10. Listing

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/
/PDP-8, 8I EXTENDED MEMORY CONTROL TEST, PLACE NUMBER
/OF EXTENDED 4K FIELDS AVAILABLE IN SR9 TO 11, (UP TO 7)
/IF USING AN 8I, PLACE SR8 ON A 1, OTHERWISE LEAVE 0.
/START PROGRAM AT 200
/
/CONSTANTS
/
        6201      CDF=6201
        6202      CIF=6202
        6214      RDF=6214
        6224      RIF=6224
        6244      RMF=6244
        6234      RIB=6234
        0001      *1
/
0001  5001      JMP 1
0002  0002      0002
0003  0003      0003
/
        0020      *20
/
0020  5400      JMP I0, JMP I 0
0021  2000      ISZ0, ISZ 0
0022  1742      XTFLG, TFLG
0023  1734      XSTKS, NSTKS
0024  1112      XRMF, TRMF
0025  1321      XRANS, TRANS
0026  1432      XAUTO, TAUTO
0027  0000      LOOP, 0
0028  0000      NDF, 0
0031  0000      STKS, 0
0032  0000      DAT, 0
0033  0000      NOSTAK, 0
0034  0000      NOFLD, 0
0035  1174      KE40M, E40-1
0036  1175      KE40, E40
0037  7402      KHLT, HLT
0040  6201      KCDF, 6201
0041  6202      KCIF, 6202
0042  0703      KCF1, CIF1-1
0043  1316      XFD, EXFD
0044  0001      K1, 1
0045  0007      K7, 7
0046  0010      K10, 10
0047  7777      K7777, 7777
0050  7000      K7000, 7000
0051  7707      K7707, 7707
0052  7767      K7767, 7767
0053  7757      K7757, 7757
0054  7747      K7747, 7747
0055  7737      K7737, 7737
0056  7727      K7727, 7727
0057  7717      K7717, 7717

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0060	7776	K7776,	7776
0061	7775	K7775,	7775
0062	7774	K7774,	7774
0063	7773	K7773,	7773
0064	7772	K7772,	7772
0065	7771	K7771,	7771
0066	7770	K7770,	7770
0067	0071	POINT,	+2

0070	0071	K7S,	.,+1
0071	7766	K7766,	7766
0072	7755		7755
0073	7744	K7744,	7744
0074	7733		7733
0075	7722		7722
0076	7711		7711
0077	7700		7700
0100	1171	XTRF,	STDF
0101	1172	XTRF1,	STDF+1
0102	1302	KXFLD,	EXFLD
0103	5402	KJMP,	JMP I 2
0104	1200	KVTR,	ENTER
0105	0020	K20,	20
0106	5507	JMP2,	JMP I KFLD0
0107	1427	KFLD0,	RTRN
0110	1422	KRTN,	E45A+2
0111	1400	XFIB,	SFIB

```

/TEST CDF AND RDF
/
0200
*200
/
0200 7200 BEGIN, CLA
0201 3027 DCA LOOP /LOOP COUNTER
/
0202 6201 DEF, CDF 00 /DF 0
0203 6214 RDF
0204 7450 SNA /SHOULD NOT SKIP
0205 5211 JMP DF7
0206 7402 E1, HLT /ERROR, CDF OR RDF FAILED
0207 7200 CLA
0210 5202 JMP DF0 /REPEAT
/
0211 1051 DEF7, TAD K7707 /7707
0212 6271 CDF 70 /DF 7
0213 6214 RDF
0214 7040 CMA /AC = 0
0215 7450 SNA /SHOULD NOT SKIP
0216 5222 JMP OK1
0217 7402 E2, HLT /CDF OR RDF FAILED
0220 7200 CLA
0221 5211 JMP DF7
/
0222 2027 OK1, ISZ LOOP /CHECK DONE
0223 5202 JMP DF0
/
0224 7200 CLA
0225 3027 DCA LOOP /LOOP COUNTER
/
0226 1052 DEF1, TAD K7767 /7767
0227 6211 CDF 10 /DF 10
0230 6214 RDF
0231 7040 CMA /AC=0
0232 7450 SNA
0233 5237 JMP DF2
0234 7402 E3, HLT /CDF1 OR RDF FAILED
0235 7200 CLA
0236 5226 JMP DF1
/
0237 1053 DEF2, TAD K7757 /7757
0240 6221 CDF 20 /DF2
0241 6214 RDF
0242 7040 CMA /AC=0
0243 7450 SNA
0244 5250 JMP OK2

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0245	7402	E4,	HLT	/CDF 2 OR RDF FAILED
0246	7200		CLA	
0247	5237		JMP DF2	
/				
0250	2027	OK2,	ISZ LOOP	/DONE IF SKIP
0251	5226		JMP DF1	
0252	7200		CLA	
0253	3027		DCA LOOP	
/				
0254	1054	DF3,	TAD K7747	/7747
0255	6231		CDF 30	/DF 3
0256	6214		RDF	
0257	7040		CMA	/AC=0
0260	7450		SNA	
0261	5265		JMP DF4	
0262	7402	E5,	HLT	/CDF 3 OR RDF FAILED
0263	7200		CLA	
0264	5254		JMP DF3	
/				
0265	1055	DF4,	TAD K7737	/7737
0266	6241		CDF 40	/DF 4
0267	6214		RDF	
0270	7040		CMA	/AC=0
0271	7450		SNA	
0272	5276		JMP OK3	
0273	7402	E6,	HLT	/CDF 4 OR RDF FAILED
0274	7200		CLA	
0275	5265		JMP DF4	
/				
0276	2027	OK3,	ISZ LOOP	/DONE IF SKIP
0277	5254		JMP DF3	
/				
0300	7200		CLA	
0301	3027		DCA LOOP	
/				
0302	1056	DF5,	TAD K7727	/7727
0303	6251		CDF 50	/DF5
0304	6214		RDF	
0305	7040		CMA	/AC=0
0306	7450		SNA	
0307	5313		JMP DF6	
0310	7402	E7,	HLT	/CDF 5 OR RDF FAILED,
0311	7200		CLA	
0312	5302		JMP DF5	
/				
0313	1057	DF6,	TAD K7717	/7717
0314	6261		CDF 60	/DF 6
0315	6214		RDF	
0316	7040		CMA	/AC=0
0317	7450		SNA	
0320	5324		JMP OK4	

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0321 7402      E8,      HLT          /CDF 6 OR RDF FAILED
0322 7200      CLA
0323 5313      JMP DF6
/
0324 2027      OK4,     ISZ LOOP      /DONE WHEN SKIP
0325 5302      JMP DF5
/
/ NOW TEST INTERRUPT BUFFER (IB) BITS 9-11 WITH
/ RIB. PI IS ENABLED. TELEPRINTER FLAG IS
/ USED FOR INTERRUPT.
/
0326 6201      CDF 00          /DF0
0327 1020      TAD JMP10      /JMP I0=JMP I 0
0330 3001      DCA 1          /C(1)=JMP I 0
0331 3027      DCA LOOP
0332 6041      TSF          /TEST TTY FLAG
0333 4422      JMS I XTFLG   /SET FLAG
/
0334 6001      I00,      ION          /ENABLE PI
0335 7200      CLA
0336 6234      RIB          /READ SF
0337 7450      SNA
0340 5343      JMP I01
0341 7402      E9,      HLT          /RIB FAILED
0342 5334      JMP I00
/
0343 6211      I01,      CDF 10      /DF 1
0344 6001      ION
0345 7200      CLA
0346 6214      RDF          /DF SHOULD BE 0 AFTER A PI
0347 7450      SNA
0350 5353      JMP ,+3
0351 7402      E10,     HLT
0352 5343      JMP I01      /DF NOT CLEARED, OR NO PI
/
0353 1060      TAD K7776
0354 6234      RIB          /READ SF
0355 7040      CMA          /AC=0
0356 7450      SNA
0357 5362      JMP OK5
0360 7402      E11,     HLT          /RIB OR SF FAILED
0361 5343      JMP I01
0362 2027      OK5,     ISZ LOOP      /DONE WHEN SKIP
0363 5334      JMP I00
0364 5765      JMP I ,+1
0365 0400      I02-2

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	0400		*400		
	0400	7200		CLA	
	0401	3027		DCA LOOP	
			/		
	0402	6221	I82,	ODF 20	/DF 2
	0403	6001		ION	
	0404	7200		CLA	
	0405	6214		RDF	/SHOULD BE 0 AFTER PI
	0406	7450		SNA	
	0407	5212	.	JMP ,+3	
	0410	7402	E12,	HLT	/DF NOT CLEARED, OR NO PI
	0411	5202		JMP I82	
			/		
	0412	1061		TAD K7775	
	0413	6234		RIB	/AC=7777
	0414	7040		CMA	/=0
	0415	7450		SNA	
	0416	5221		JMP I83	
	0417	7402	F13,	HLT	/RIB OR SF FAILED
	0420	5202		JMP I82	
			/		
	0421	6231	I83,	ODF 30	/DF3
	0422	6001		ION	
	0423	7200		CLA	
	0424	6214		RDF	/DF SHOULD BE CLEARED
	0425	7450		SNA	
	0426	5231		JMP ,+3	
	0427	7402	F14,	HLT	/DF NOT CLEARED
	0430	5221		JMP I83	
			/		
	0431	1062		TAD K7774	
	0432	6234		RIH	/AC=7777
	0433	7040		CMA	/AC=0
	0434	7450		SNA	
	0435	5240		JMP OK6	
	0436	7402	F15,	HLT	/RIB OR SF FAILED
	0437	5221		JMP I83	
			/		
	0440	2027	OK6,	ISZ LOOP	/DONE IF SKIP
	0441	5202		JMP I82	
			/		
	0442	7200		CLA	
	0443	3027		DCA LOOP	
			/		
	0444	6241	I84,	ODF 40	/DF 3
	0445	6001		ION	
	0446	7200		CLA	
	0447	6214		RDF	/DF MWSV BE 000 AFV ER A PI
	0450	7450		SNA	/ERROR IF SKIP
	0451	5254		JMP ,+3	

0452	7402	E16,	HLT	/DF NOT 0 AFTER PI
0453	5244		JMP IB4	
		/		
0454	1063		TAD K7773	/AC=7773
0455	6234		RIB	/AC=7777
0456	7040		CMA	/AC=0
0457	7450		SNA	
0460	5263	E17,	JMP IB5	/RIB OR SF FAILED
0461	7402		HLT	
0462	5244		JMP IB4	
		/		
0463	6251	IB5,	CDF 50	/DF5
0464	6201		ION	
0465	7200		CLA	
0466	6214		RDF	/DF SHOULD=000
0467	7450		SNA	
0470	5273		JMP ,+3	
0471	7402	E18,	HLT	/DF NOT 0 AFTER PI
0472	5263		JMP IB5	
		/		
0473	1064		TAD K7772	/AC= 7772
0474	6234		RIB	/ = 7777
0475	7040		CMA	/ = 0
0476	7450		SNA	
0477	5302		JMP OK7	
0500	7402	E19,	HLT	/RIB OR SF FAILED
0501	5263		JMP IB5	
		/		
0502	2027	OK7,	ISZ LOOP	/DONE IF 0 AND SKIP
0503	5244		JMP IB4	
		/		
0504	7200		CLA	
0505	3027		DCA LOOP	
		/		
0506	6261	IB6,	CDF 60	/DF6
0507	6001		ION	
0510	7200		CLA	
0511	6214		RDF	/DF MUST=0 AFTER PI
0512	7450		SNA	
0513	5316		JMP ,+3	
0514	7402	E20,	HLT	/DF NOT 0 AFTER PI
0515	5306		JMP IB6	

0516	1065	/	TAD K7771	/,7771
0517	6234		RIB	/AC=7777
0520	7040		CMA	
0521	7450		SNA	
0522	5325		JMP IB7	
0523	7402	E21,	HLT	/RIB OR SF FAILED
0524	5306		JMP IB6	
/				
0525	6271	IB7,	ODF 70	/DF 7
0526	6001		ION	
0527	7200		CLA	
0530	6214		RDF	/DF MUST = 0 AFTER PI
0531	7450		SNA	
0532	5335		JMP ,+3	
0533	7402	E22,	HLT	/DF NOT 0
0534	5325		JMP IB7	
/				
0535	1066		TAD K7770	
0536	6234		RIB	/AC=7777
0537	7040		CMA	
0540	7450		SNA	
0541	5344		JMP OK8	
0542	7402	E23,	HLT	/RIB OR SF FAILED
0543	5325		JMP IB7	
/				
0544	2027	OK8,	ISZ LOOP	/DONE IF 0
0545	5306		JMP IB6	
0546	5747		JMP I ,+1	/NEW PAGE
0547	0600		600	

0600.

*600

/LOW TEST DCA I AND TAD I TO ALL STACKS. NUMBER OF
/EXTENDED STACKS SHOULD BE IN SR9 TO 11. EACH STACK WILL
/CONTAIN ITS DF# IN LOCATION 7000.
/

0600	3027		
0601	4423		
0602	7021		
0603	3030		
0604	1040		
0605	1046		
0606	3207		
0607	6201		
0610	1030		
0611	3450		
0612	2031		
0613	7410		
0614	5222		
0615	1046		
0616	1207		
0617	3207		
0620	2030		
0621	5207		
/			
0622	4423		
0623	7021		
0624	3030		
0625	1040		
0626	1046		
0627	3230		
0630	6201		
0631	1450		
0632	3032		
0633	1032		
0634	7041		
0635	1030		
0636	7640		
0637	5252		
0640	2031		
0641	5245		
0642	2027		
0643	5201		
0644	5256		
0645	1046		
0646	1230		
0647	3230		
0650	2030		
0651	5230		
/			
0652	1032		
0653	7402		
/			
0654	7200		

DCAI,	DCA LOOP	
	JMS I XSTKS	/READ SR 9-11
	IAC	
	DCA NDF	/DF NUMBER = 1 TO START
	TAD KCOF	/6201
	TAD K10	
DFLD,	DCA .+1	/DF 001 TO START WITH
	CDF 00	/WILL BE INCREMENTED
	TAD NDF	/DF#
	DCA I K7000	/PUT IN 7000 OF STACK
	ISZ STKS	/ALL STACKS WHEN 0
	SKP	
	JMP TADI	/TEST TAD I
	TAD K10	
	TAD DFLD	/INCR. CDF 10T
	DCA DFLD	
	ISZ NDF	
	JMP DFLD	/-
/		
TADI,	JMS I XSTKS	/SR9=11 AGAIN
	IAC	
	DCA NDF	/DF#=1 AGAIN
	TAD KCOF	/6201
	TAD K10	
	DCA .+1	
TFLD,	CDF 00	
	TAD I K7000	/AC=DF CONTENTS NOW
	DCA DAT	/SAVE TEMP
	TAD DAT	
	CIA	/2'S COMP
	TAD NDF	/BETTER BE EQUAL
	SZA CLA	
	JMP E24-1	/ERROR PATH
	ISZ STKS	/ALL WHEN 0
	JMP .+4	
	ISZ LOOP	/DONE WHEN 0
	JMP DCAI	
	JMP IBSF	/NEXT TEST
	TAD K10	
	VAD VFLD	/CDF IOV + 10
	DCA TFLD	
	ISZ NDF	
	JMP TFLD	
/		
E24,	TAD DAT	/DATA AS READ
	HLT	/AC=DATA READ. DF INDICATORS
		/EQUAL FIELD WHERE GOT DATA.
		/BOTH SHOULD BE EQUAL
	CLA	

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0655 5230

JMP TFLD

/
 /CHECK TEST CIF WITH PROGRAM INTERRUPT ENABLED, THE
 /I.F. SHOULD ALWAYS = 00 SINCE A JMP OR JMS IS EX-
 /ECUTED AFTER THE CIF IOT. THE SF REGISTER IS
 /RESET WITH THE RIB IOT AFTER THE INTERRUPT,
 /IF THE I.F. IS SET A HLT WILL OCCUR AT LOC. 1
 /IF THE EXTENDED FIELD,
 /A HLT WILL OCCUR AFTER THE ION IOT
 /IF NO INTERRUPT OCCURS, PRESS CONT. TO REPEAT.

/IF P LCCS. 1, 2 TO = ISZ W, AND
 /IF P I L, RESPECTIVELY.

0656	6201	LDI R, CDF 00	/SET DF TO 000.
0657	1021	LDI R, IAD ISZ0	/ISZ 0
0658	3021	JCA 1	
0661	1022	LDI R, IAD JMRI0	/JMR I 0
0662	3022	JCA 2	

/IF P I L A HLT IF LOC. 1 OF ALL EXTENDED FIELDS.

0663	4023	JMS I XSTKS	
0664	1040	LDI R, KCDF	
0665	1040	LDI R, K10	
0666	3067	JCA ,+1	
0667	6011	LDI R, CDF 10	/FIELD 1 TO START WITH
0670	1047	LDI R, KHI 7	/KHLT = 7402
0671	3044	JCA I K1	
0672	2031	ISZ STKS	/ALL FIELDS WHEN SKIP
0673	7410	RSP	
0674	5277	JMP ,+3	
0675	1067	LDI R, HLTS	
0676	5260	JMP HLTS-1	

/IF P I L CIF TESTS

0677	6201	LDI R, CDF 00	
0678	6041	VSF	
0681	4402	JMS I XTEP	/SET TTY FLAG
0682	3027	JCA LOOP	
0683	4423	JMS I XSTKS	/READ SR 9-11
0684	6212	LDI R, CIF 10	/FIELD 1
0685	6011	ION	
0686	7000	IGP	
0687	5010	JMP ,+1	
0688	7402	HLT	/ERROR, NO PT OR INHIBIT PT
0689	6234	RIB	/RETURN HERE FROM LOC.3
0692	1062	LDI R, K7760	
0693	7040	SMA	
0694	7650	SNA CLA	/OK IF NO SKIP
0695	5322	JMP OKF1	
0696	6234	RIB	
0697	7402	HLT	/I.F. OR S.F. FAILED, C(AC)=C(1B)

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0720 7200
0721 5304

CLA
JMP CIF1

/REPEAT

```

/
0720 2031      / 0KF1,  ISZ STKS          /ALL FIELDS IF 0
0721 5327      JUMP CIF2
0722 2027      ISZ LOOP          /ALL DONE IF 0
0723 5303      JUMP CIF1-1
0724 5424      JUMP I XRMF          /TEST RMF
/
0727 6222      / CIF2,  CIF 22          /FIELD 2
0728 6201      ION
0729 7022      NOP
0730 5333      JUMP ,+1
0731 7402      / E27,  HLT          /NO PI OR INHIBIT PI
0732 6234      RIB          /RETURN FROM LOC.3
0733 1053      TAD K7757
0734 7040      CMA
0735 7650      SNA CLA          /ERROR IF SKIP
0736 5345      JUMP 0KF2
0737 6234      RIB
0738 7402      / E28,  HLT          /IR OR SF FAILED, C(AC)=C(IB)
0739 7200      CLA
0740 5327      JUMP CIF2
/
0745 2031      / 0KF2,  ISZ STKS          /ALL FIELDS IF 0
0746 5352      JUMP CIF3
0747 2027      ISZ LOOP          /ALL DONE IF 0
0748 5303      JUMP CIF1-1
0749 5424      JUMP I XRMF          /TEST RMF
/
0752 6232      / CIF3,  CIF 30          /FIELD 3
0753 6201      ION
0754 7022      NOP
0755 5356      JUMP ,+1
0756 7402      / E29,  HLT          /NO PI OR INHIBIT PI
0757 6234      RIB          /RETURN FROM LOC.3
0758 1054      TAD K7747
0759 7040      CMA
0760 7650      SNA CLA          /ERROR IF SKIP
0761 5370      JUMP 0KF3
0762 6234      RIB
0763 7402      / E30,  HLT          /SF OR IR FAILED, C(AC)=C(IB)
0764 7200      CLA
0765 5352      JUMP CIF3
/
0770 2031      / 0KF3,  ISZ STKS          /ALL FIELDS IF 0
0771 5775      JUMP I ,+4
0772 2027      ISZ LOOP          /ALL DONE IF 0
0773 5303      JUMP CIF1-1
0774 5424      JUMP I XRMF          /TEST RMF
0775 1000      CIF4
/

```

```

/POP-8,81 EXT, MEM, CONTROLL TEST-TAPE 2
*1000
/
1000 6242 CIF4, CIF 40 /FIELD 4
1001 6001 ION
1002 7000 NOP
1003 5204 JMP ,+1
1004 7402 E31, HLT /NO PI OR INHIBIT PI
1005 6234 RIB /JMP TO HERE FROM LOC, 3
1006 1055 TAD K7737
1007 7040 CMA
1010 7650 SNA CLA /AC MUSV BE 0
1011 5216 JMP OKF4
1012 6234 RIB
1013 7402 E32, HLT /IB OR SF FAILED, C(AC)=C(IB)
1014 7200 CLA
1015 5200 JMP CIF4
/
1016 2031 OKF4, ISZ STKS /ALL FIELDS IF 0
1017 5223 JMP CIF5
1020 2027 ISZ LOOP /ALL DONE IF 0
1021 5442 JMP I KCF1
1022 5312 JMP TRMF /TEST RMF
/
1023 6252 CIF5, CIF 50 /FIELD 5
1024 6001 ION
1025 7000 NOP
1026 5227 JMP ,+1
1027 7402 E33, HLT /NO PI OR INHIBIT PI
1030 6234 RIB /JMP HERE FROM LOC, 3
1031 1056 TAD K7727
1032 7040 CMA
1033 7650 SNA CLA /ERROR IF SKIP
1034 5241 JMP OKF5
1035 6234 RIB
1036 7402 E34, HLT /IB OR SF FAILED, C(AC)=C(IB)
1037 7200 CLA
1040 5223 JMP CIF5
/
1041 2031 OKF5, ISZ STKS /DONE WHEN SKIP
1042 5246 JMP CIF6
1043 2027 ISZ LOOP /512 VIMES IF SKIP
1044 5442 JMP I KCF1
1045 5312 JMP TRMF /TEST RMF
/
1046 6262 CIF6, CIF 60 /FIELD 6
1047 6001 ION
1050 7000 NOP
1051 5252 JMP ,+1
1052 7402 E35, HLT /NO PI OR INHIBIT PI
1053 6234 RIB /JMP HERE FROM LOC, 3
1054 1057 TAD K7717
1055 7040 CMA
1056 7650 SNA CLA /TO SKIP IS TO ERROR

```

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1057 5264
1760 6234

JMP OKF6
R18

1061	7402	E36,	HLT	/IB OR SF FAILED, C(AC)=C(1B)
1062	7200		CLA	
1063	5246		JMP CIF6	
		/		
1064	2031	OKF6,	ISZ STKS	/SEE IF ALL FIELDS
1065	5271		JMP CIF7	
1066	2027		ISZ LOOP	/ALL DONE WHEN SKIP
1067	5442		JMP I KCF1	
1070	5312		JMP TRMF	/TEST RMF
		/		
1071	6272	CIF7,	CIF 70	/FIELD 7
1072	6001		ION	
1073	7000		NOP	
1074	5275		JMP ,+1	
1075	7402	E37,	HLT	/NO PI OR INHIBIT PI
1076	6234		RIB	/RETURN HERE FROM LOC,3
1077	1051		TAD K7707	
1100	7040		CMA	
1101	7650		SNA CLA	/ERROR IF SKIP
1102	5307		JMP OKF7	
1103	6234		RIB	
1104	7402	E38,	HLT	/IB OR SF FAILED, C(AC)=C(1B)
1105	7200		CLA	
1106	5271		JMP CIF7	
		/		
1107	2027	OKF7,	ISZ LOOP	/DONE IF SKIP
1110	5442		JMP I KCF1	
1111	5312		JMP TRMF	/TEST RMF

```

/
/TEST INTERRUPT INHIBIT
/FROM EACH FIELD, REFER TO HEADING TITLED "EXTENDED
/FIELD TEST ROUTINE", THIS ROUTINE IS PLACED IN
/EACH TESTED FIELD AT THE ADDRESSES SPECIFIED, THE
/INDICATED ERROR HALTS WILL BE IN THE EXTENDED
/FIELD. PRESS CONT, TO RECOVER, ONLY 1 FIELD WILL
/CONTAIN THE ROUTINE AT ANY ONE TIME, OTHER FIELDS
/WILL CONTAIN ALL 0'S. THE ROUTINE IS REPLACED WITH
/HALTS AFTER COMPLETION, THE PORTIONS OF THE FIELD
/WHICH DO NOT CONTAIN THE ROUTINE ARE SET TO 0000
/BEFOREHAND,
/
/

```

```

/SETUP FIELDS TO TEST, POINTERS, ETC.,
/

```

```

1112 4423
1113 1040
1114 3322
1115 1322
1116 1046
1117 3322
1120 7040
1121 3010
1122 6201
1123 3410
1124 1010
1125 7040
1126 7640
1127 5323
1130 2031
1131 5315

```

```

TRMF,   JMS I XSTKS   /READ SR9-11
        TAD KCDF     /6201
        DCA ,+6
        TAD ,+5
        TAD K10
        DCA ,+3
        CMA
        DCA 10
        CDF 00
        DCA I 10     /PLACE 0'S IN EACH FIELD FROM
                    /LOC, 0 TO 7777,
        CMA
        SZA CLA
        JMP , -4
        ISZ STKS
        JMP TRMF+3

```

/
 /NOW PUT A HLT IN EACH FIELD IN THE SAME
 /LOCATION AS E40, BELOW.
 /

1132	4423		JMS I XSTKS	/READ SR 9-11
1133	1040		TAD KCDF	
1134	1046		VAD K10	
1135	3336		DCA ,+1	
1136	6201	CHDF,	CDF 00	
1137	1036		TAD KE40	/KE40 = ADDRESS OF E40.
1140	3027		DCA LOOP	/SAVE TEMPORARILY
1141	1037		TAD KHLT	/KHLT = 7402 (HLT)
1142	3427		DCA I LOOP	
1143	2031		ISZ STKS	/DONE ALL STACKS WHEN SKIP
1144	7410		SKP	
1145	5350		JMP ,+3	
1146	1336		TAD CHDF	
1147	5334		JMP CHDF-2	
/				
1150	6201		CDF 00	
1151	6041	STDF,	TSF	/CHECK TTY FLAG
1152	4422		JMS I XTFLG	/GO SET IT
1153	1051		TAD K7707	
1154	3027		DCA LOOP	
1155	1067		TAD POINT	
1156	3070		DCA K7S	/POINTER FOR K7700 TO K7766
1157	4423		JMS I XSTKS	/READ SR 9-11
1160	1040		TAD KCDF	/6201
1161	1046		TAD K10	/10
1162	3371		DCA STDF	
1163	1041		TAD KCIF	/6202
1164	1046		TAD K10	/10
1165	3372		DCA STDF+1	
1166	1372		TAD STDF+1	
1167	3443		DCA I XFD	
1170	4425		JMS I XRANS	/PUT TEST ROUTINE INTO FIELD X
/				
1171	6211	STDF,	CDF 10	/FIELD 1 TO START WITH
1172	6212		CIF 10	
1173	5374		JMP ,+1	/SHOULD ENTER EXTENDED FIELD
1174	7000		NOP	/AFTER THIS JMP, HLT IF NOT
1175	7402	E40,	HLT	/ERROR, PI FAILED
1176	5371		JMP STDF	/C(AC) = C(I.B.)
				/REPEAT SAME TEST.

```

/ENTER HERE AFTER PI FROM EXTENDED BANK
*1200
/
1200 6214 ENTER, RDF /DF SHOULD BE 000
1201 7450 SNA /ERROR IF SKIP
1202 5206 JMP ,+4 /CHECK C(SF)
1203 7402 E41, HLT /AC=C(DF)
1204 7200 CLA
1205 5500 JMP I XTDF /REPEAT TEST
1206 6212 CIF 10 /SET I,B. TO FIELD 1
1207 6244 RMF /I,B. NOW EQUAL TO SF
1210 6234 RIB /READ IB
1211 6202 CIF 00
1212 6201 CDF 00
1213 1470 TAD I K7S
1214 7040 CMA
1215 7650 SNA CLA /ERROR IF SKIP
1216 5226 JMP CKPC
1217 6244 RMF
1220 6234 RIB
1221 7402 E42, HLT /ERROR RMF AND PI WORKED, BUT
/I,B. NOT CORRECT AFTER RMF.
/AC=C(IB)
1222 7200 CLA
1223 6201 CDF 00
1224 6202 CIF 00
1225 5500 JMP I XTDF /BACKUP A PAGE AND REPEAT
/
CKPC, TAD KE40 /KE40=ADDRESS OF E40
IAC /MAKE E40+1
CIA
TAD 0 /COMPARE TO C(0)
SNA CLA /SHOULD NOT SKIP
JMP ,+5 /ALL OK SETUP FOR NEXT FIELD
TAD 0
E43, HLT /ERROR, ALL WORKED, BUT
/C(PC) WAS NOT=TO E40+1
/AFTER PI IN EXTENDED
/FIELD, C(AC)=C(0),F0,
/CHECK FOR PI NOT INHIBITED,
/OR AUTO-INDEX REG,
/12 FAILING IN THE EXTENDED FIELD.
1236 7200 CLA
1237 5500 JMP I XTDF /BACKUP AND REPEAT
/
/SETUP FOR NEXT FIELD
/
1240 2031 ISZ STKS /DONE ALL IF SKIP
1241 5246 JMP ,+5
1242 2027 ISZ LOOP /DONE LOOPING IF SKIP
1243 5645 JMP I ,+2 /REPEAT ALL AGAIN
1244 5511 JMP I XFIB /EXIT TO NEXT TEST
1245 1155 STRMF+4 /BACK TO LAST PAGE

```

/
 /SET LAST TESTED FIELD TO ALL 0'S AND PUT A
 /HIT IN RESPECTIVE ADDRESS OF E40
 /

1246	7240	CLA CMA	
1247	3010	DCA 10	
1250	1500	TAD I XTDF	/CDF X0 AT STDF
1251	3252	DCA ,+1	
1252	6211	CDF 10	/F1 TO START WITH
1253	3410	DCA I 10	
1254	1010	TAD 10	
1255	7040	CMA	
1256	7640	SZA CLA	/CLEAR IF SKIP
1257	5253	JMP ,-4	
1260	6201	CDF 00	
1261	1500	TAD I XTDF	/CDF X0 AT STDF
1262	3263	DCA ,+1	
1263	6211	CDF 10	
1264	1037	TAD KHLT	/=7402 (HLT)
1265	3436	DCA I KE40	/KE40=ADDRESS OF E40
1266	6201	CDF 00	/RESTORE DF

/
 /INCREMENT CDF AND CIF 10'S AT STDF, STDF+1
 /TO NEXT FIELD,
 /

1267	1500	TAD I XTDF	/CDF X0 AT STDF
1270	1046	VAD K10	
1271	3500	DCA I XTDF	
1272	1501	TAD I XTDF1	/CIF X0 AT STDF
1273	1046	TAD K10	
1274	3501	DCA I XTDF1	
1275	1501	TAD I XTDF1	
1276	3316	DCA EXFD	
1277	2070	ISZ K7S	
1300	4321	JMS TRANS	/PUT ROUTINE IN NEW FIELD
1301	5500	JMP I XTDF	/TEST NEW FIELD

/EXTENDED FIELD TEST ROUTINE

/THE FOLLOWING INSTRUCTIONS ARE PLACED IN
 /EACH EXTENDED FIELD TESTED, THE NUMBERS IN THE
 /COMMENTS FIELD CORRESPOND TO THE
 /MEMORY LOCATIONS IN THE TESTED FIELD, LOCATIONS
 /0 THRU 11 ARE USED FOR AN ERROR ROUTINE
 /IN CASE FIELD 0 IS NOT ENTERED AFTER AN
 /INTERRUPT, THE EXTENDED FIELD SHOULD BE
 /ENTERED AT LOCATION E40-1 WHICH CORRESPONDS
 /TO E40-1 IN FIELD 0.

/EXTENDED FIELD INSTRUCTIONS:

```

/
EXFLD, 0      /0
1302 0000      TAD 0      /1
1303 1000      SNA      /IF LOC. 0 NOT =0 PI DIDN'T
1304 7450      /ENTER FIELD 0
                JMP ,+5  /3
1305 5312      E44,   HLT      /4, INTERRUPTED TO THIS FIELD
1306 7402      /INSTEAD OF FIELD 0.C(AC)=C(0)
                /WHICH SHOULD BE E40+1
                /IF NOT, CHECK LOC, 7777, IT
                /MUST = 5412 (JMP I 12).
                CLA      /5
1307 7200      DCA 0      /6
1310 3000      JMP I 20    /7, C(20) =E40
1311 5420      E45,   HLT      /10, THE JMP I 12 AT LOC,
1312 7402      /7777 WAS NOT EXECUTED,
                /OR INTERRUPT FAILED, IF
                /NO INTERRUPT, LOCATION 12
                /NOW CONTAINS 0 INSTEAD
                /OF ADDRESS E40,
                JMP , -4 /11, REPEAT IN THIS FIELD
1313 5307      E40     /12, AUTO-INDEXS TO E40+1
1314 1175      /IN F 0 IF THE JMP I 12
                /WORKS,
                /LOCS. 13 TO 17 ARE ALL 0'S
                /
1315 1175      E40     /20, EQUALS E40 IN F0,
                /
                /LOCS. 21 TO E40-2 ARE ALL 0'S
                /
EXFLD, CIF 10  /FIELD 1 TO START WITH
1316 6212      ION      /LOC. E40, SEE SYMBOL TABLE
1317 6001      /FOR E40,
                /LOCS. E40+1 TO 7776 ARE ALL 0'S
                /
1320 5412      JMP I 12      /7777, PI SHOULD OCCUR,
                /AFTER THIS INSTRUCTION,
                /TO FIELD 0,

```

```

/
/ROUTINE TO TRANSFER TEST ROUTINE TO PROPER FIELD
/
1321 0000      TRANS, 0
1322 1103      TAD KJMP          /KJMP=JMP I 2
1323 3001      DCA 1            /IN FIELD 0
1324 1104      TAD KNTR          /KNTR = LOC, ENTER
1325 3002      DCA 2            /OF FIELD 0
1326 1102      TAD KXFLD         /KXFLD = LOC, EXFLD
1327 3010      DCA 10
1330 3011      DCA 11
1331 1071      TAD K7766         /1-10 DECIMAL
1332 3000      DCA 0            /SAVE
1333 1500      TAD I XTDF        /CDF X0 IN STDF
1334 3337      DCA ,+3
1335 6201      CDF 00
1336 1410      TAD I 10
1337 6211      TRFLD, CDF 10    /F1 TO START WITH
1340 3411      DCA I 11         /PUT IN EXTENDED FIELD
1341 2000      ISZ 0           /DONE LOCS 1 TO 12 IF SKIP
1342 5335      JMP ,=5
1343 1337      TAD TRFLD
1344 3347      DCA ,+3
1345 6201      CDF 00
1346 1410      TAD I 10
1347 6211      CDF 10
1350 3505      DCA I K20        /PUT E40 IN LOC. 20
1351 6201      CDF 00
1352 1337      TAD TRFLD
1353 3355      DCA ,+2
1354 1410      TAD I 10
1355 6211      CDF 10
1356 3435      DCA I KE40M     /PUT CIF X0 IN E40-1
1357 6201      CDF 00
1360 1337      TAD TRFLD
1361 3363      DCA ,+2
1362 1410      TAD I 10
1363 6211      CDF 10
1364 3436      DCA I KE40     /ION TO LOC, E40
1365 6201      CDF 00
1366 1337      TAD TRFLD
1367 3371      DCA ,+2
1370 1410      TAD I 10
1371 6211      CDF 10
1372 3447      DCA I K777     /PUT JMP I 12 IN 7777
1373 6201      CDF 00
1374 5721      JMP I TRANS    /EXIT

```

1400

```

*1400
/
/TEST SF WITH AN RMF IOT, AN INTERRUPT IN FIELD 0 IS CREATED, AFTER
/WHICH, THE DF AND IR REGISTERS ARE SET TO FIELD 1,
/THE SF SHOULD CONTAIN FIELD 0, THE TEST
/THEN MAKES SURE THE IR IS CLEARED, THEN SET BY ISSUING AN RMF,
/FOLLOWED BY A JMP I K7000, IF THE IR IS CLEARED, THE JMP GOES TO 7000 IN FIELD 0.
/IF THE IR AND SF ARE INCLUSIVE OR'D, THE JMP GOES TO 7000 IN FIELD 1, AND
/A HALT OCCURS THERE. RESTART FROM 1400 AFTER AN ERROR. THE TEST IS LOOPEO
/512 TIMES,
/

```

```

1400 6041 SFIB, TSF /SEE IF FLAG IS SET.
1401 4422 JMS I XFLD /SET IT
1402 1450 TAD K7000 /7000
1403 3027 DCA LOOP
1404 6211 CDF 10 /DF=FIELD 1
1405 1037 TAD KHLT /HLT
1406 3450 DCA I K7000 /7000, FIELD 1=HLT
1407 6201 CDF 00 /DF=0
1408 1126 TAD JMP2 /JMP2=JMP I KFLD0
1411 3450 DCA I K7000 /7000, FIELD 0=JMP I KFLD0
/KFLD0=LOC, RTN
/KJMP=JMP I 2
1412 1138 TAD KJMP
1413 3001 DCA 1
1414 1110 TAD KRTN /KRTN=LOC, E45A+2
1415 3022 DCA 2

```

```

/
/REGIN TEST
/

```

```

1415 6001 IOV /ENABLE PI
1417 7000 NOP
1418 7000 E45A, HLT /ERROR NO PI
1419 1000 JMP SFIB /REPEAT TEST
/

```

```

/RETURN HERE AFTER PI
/

```

```

1420 7000 CLA
1423 6211 CDF 10 /DF=FIELD1
1424 6212 CDF 10 /IR=FIELD1
1425 6244 RRF /IR SHOULD=FIELD0
1426 5450 JMP I K7000 /IF SHOULD=FIELD0
/
RTN, ISZ LOOP /WORKED OK
1430 5216 JMP E45A-2 /LOOP
1431 5232 JMP TA010 /DONE, GO TO NEXT TEST

```

```

/
/
/TEST ALL AUTO-INDEX REGISTERS IN EACH EXTENDED FIELD.
/IDENTICAL TEST ROUTINES ARE PERFORMED FROM EACH FIELD.
/AND ERROR HALTS OCCUR IN THE FIELD CURRENTLY RUNNING
/THE ROUTINE. PRESS CONT, TO RESUME TESTING. EACH
/FIELD CONTAINS ALL W'S EXCEPT FOR THE AREA OCCUPIED
/BY THE TEST ROUTINE. FIELD 0 IS RE-ENTERED
/AFTER EACH TEST, AND THE NEXT SEQUENTIAL FIELD
/IS THEN ENTERED. REFER TO THE HEADING "AUTO-
/INDEX TEST" FOR THE SEQUENCE OF OPERATIONS.
/
AUTO,   CDF 00
1432    6201
1433    1051      TAD K7707
1434    3027      DCA LOOP           /LOOP COUNTER
1435    4423      JMS I XSTKS       /READ SR 9-11
1436    1040      TAD KCDF           /6201
1437    3246      DCA DFN
1440    1246      MVD DF,   TAD DFN
1441    1046      TAD K10           /INCREMENT DF
1442    3246      DCA DFN
/
/ CLEAR ONE FIELD TO 0
/
1443    7040      CHA
1444    3010      DCA 10
1445    3000      DCA 0           /USE LOC. 0 FOR A COUNTER
1446    6211      MVA,   CDF 10       /FIELD 1 TO START WITH
1447    3410      DCA I 10
1450    2000      ISZ 0
1451    5247      JMP .-2
1452    6201      CDF 00
/
/ MOVE PUT TEST ROUTINE IN THE EXTENDED FIELD
/
1453    1316      TAD DOAUTO       /1ST LOC. OF ROUTINE MINUS 1
1454    3010      DCA 10           /SOURCE
1455    1073      TAD K7744           /=28 DECIMAL
1456    3000      DCA 0           /USE LOC. 0 AS COUNTER
1457    1316      TAD DOAUTO
1460    3011      JCA 11           /DESTINATION
1461    1246      TAD DFN           /CDF X0
1462    3265      DCA .+3
1463    6201      MOVE,   CDF 00
1464    1410      TAD I 10
1465    6211      CDF 10           /FIELD 1 TO START
1466    3411      JCA I 11
1467    2000      ISZ 0           /MOVE WHEN SKIP
1470    5263      JMP MOVE

```

```

/
/NOW SET AUTO-I REGS 10 TO 17 TO 7777,
/
1471 1066      TAD K7770          /-8 DECIMAL
1472 3000      DCA 0
1473 1045      TAD K7          /7
1474 3010      DCA 10
1475 7040      CMA          /7777
1476 3410      DCA I 10
1477 2000      ISZ 0          /10 TO 17 = 7777 WHEN SKIP
1500 5275      JMP , -3
1501 7040      CMA
1502 3447      DCA I K7777    /PUT 7777 IN LOC, 7777 OF EXTENDED FIELD
1503 6214      RUF          /READ D.F.
1504 1041      TAD KCIF      /6202
1505 3306      DCA , +1
1506 6212      CIF 10       /FIELD 1 TO START
1507 4715      JMS I FILDX   /ENTER EXTENDED FIELD
                               /515 OCTAL LOCS, BEFORE THE
                               /TAD I 10 INSTRUCTION.
                               /THIS IS A TEST OF THE
                               /DEFER BIT, 500 US DELAY
/
/ENTER FIELD 0 FROM EXTENDED FIELD HERE.
/
1510 2031      GOTO, ISZ STKS  /DONE ALL WHEN SKIP
1511 5240      JMP NEWDF      /SETUP FOR NEXT
1512 2027      ISZ LOOP      /ALL DONE IF SKIP
1513 5235      JMP NEWDF_3    /REPEAT ALL
1514 5353      JMP CSR8      /CHECK SR 8
/
1515 1001      FILDX, 00AUTO-515

```

```

/
/      AUTO-INDEX TEST
/
/THE ROUTINE WILL BE PLACED IN THE SAME RESPECTIVE
/LOCATIONS IN EACH EXTENDED FIELD. ANY ERROR
//HALT WILL OCCUR IN THE EXTENDED FIELD. PRESS
/CONTINUE TO PROCEED WITH TESTING. THE INDEX
/REGISTERS 10 TO 17 INITIALLY CONTAIN 7777, AND
/ARE AUTO-INDEXED TO 0000 BY A TAD I INSTRUCTION,
/ A HALT OCCURS IF THE REG. IS NOT INCREMENTED TO 0.
/THE TAD I WOULD HAVE THEN REFERENCED LOC. 7777,
/WHICH CONTAINS 7777.
/

```

1516	1516	DDAUTO, .	/THIS LOC. IS NOT MOVED TO
			/THE EXTENDED FIELD,
1517	7200	CLA	
1520	1410	TAD I 10	
1521	7440	SZA	
1522	7402	E46, HLT	/ERROR, INDEX REG. 10 FAILED
1523	1411	TAD I 11	
1524	7440	SZA	
1525	7402	E47, HLT	/INDEX REG. 11 FAILED
1526	1412	TAD I 12	
1527	7440	SZA	
1530	7402	E48, HLT	/12 FAILED
1531	1413	TAD I 13	
1532	7440	SZA	
1533	7402	E49, HLT	/13 FAILED
1534	1414	TAD I 14	
1535	7440	SZA	
1536	7402	E50, HLT	/14 FAILED
1537	1415	TAD I 15	
1540	7440	SZA	
1541	7402	E51, HLT	/15 FAILED
1542	1416	TAD I 16	
1543	7440	SZA	
1544	7402	E52, HLT	/16 FAILED
1545	1417	TAD I 17	
1546	7440	SZA	
1547	7402	E53, HLT	/17 FAILED
1550	6201	CDF 00	/SET DF TO FIELD 0
1551	6202	CIF 00	/SET I,B. TO FIELD 0
1552	5310	JMP GOTO0	/EXIT TO FIELD 0
		/END OF TEST ROUTINE	
		/	
		/	

/CHECK SR 8. IF AN 8I IS BEING USED SR 8 MUST BE
/ON A 1. OTHERWISE, 0.

1553 7604
1554 0246
1555 7640
1556 5766
1557 0007
1560 1357
1561 6046
1562 6041
1563 5362
1564 5765

1565 0200
1566 1600

```

/
CSR8,  LAS
      AND K10
      SZA CLA
      JHP I XMEM          /NEXT TEST
      AND 7
BELL,  TAD .-1
      TLS                /RING BELL
      TSF
      JMP .-1
      JMP I XBGN         /START OVER AT 200
/
XBGN,  BEGIN
XMEM,  NOMEM
    
```

1600

```

/
*1600
/
/REFERENCE ALL 4K FIELDS NOT PRESENT, IF 32K
/IS PRESENT, THE TEST IS BY-PASSED, AND PROGRAM IS
/RESTARTED AT 200, EACH FIELD NOT PRESENT IS
/REFERENCED BY THE PROGRAM WITH JMP, DCA AND TAD.
//THE PROGRAM MUST CONTINUE IN SEQUENCE/ THE TTY
/BELL WILL SIGNAL A SUCCESSFUL TEST, AND THE PRO-
/GRAM IS THEN RESTARTED AT 200.
/

```

```

1600 7200
1601 1066
1602 3027
1603 7604
1604 0045
1605 7041
1606 1045
1607 7450
1610 5652
1611 3033
1612 3651

```

```

NOPEM,  CLA
        TAD K7770
        DCA LOOP
        LAS
        AND K7
        CIA
        TAD K7
        SNA
        JMP I XBELL
        DCA NOSTAK
        DCA I XELL

```

```

/TEST LOOP COUNTER
/READ SR9=11

/SUBTRACT MAX, POSSIBLE

/32K PRESENT, CAN'T TEST
/SAVE NO, MISSING
/CLEAR THE TLS IOT AT
/BELL+1 TO PROHIBIT
/FAUSE INDICATION, TLS
/IS RESTORED LATER WRONG
/ENTRY FROM NON-EXISTENT
/MEMORY MAY CAUSE A
/HANG=UP AT BELL+2 AND +3.
/# OF FIELDS PRESENT

/+1 TO GET 1ST MISSING

/POSITION TO AC 6-8,

/1ST MISSING
/# STACKS NOT HERE

/USED AS COUNTER

```

```

1613 7604
1614 0045
1615 7001
1616 7100
1617 7006
1620 7004
1621 3034
1622 1033
1623 7041
1624 3033

```

```

LAS
AND K7
IAC
CLL
RTL
RAL
DCA NOFLD
TAD NOSTAK
CIA
DCA NOSTAK

```

1625 1040
 1626 1034
 1627 3262
 1630 1040
 1631 1034
 1632 3307

```

/
/
TAD KCDF          /601
TAD NOFLD        /MISSING STACK
DCA CDF0S
TAD KCDF
TAD NOFLD
DCA CDF1S

```

/NOW SEE IF AN ODD OR EVEN NUMBER IS MISSING

1633 1033
 1634 7041
 1635 7010
 1636 7620

```

TAD NOSTAK
CIA
RAR
SNL CLA

```

/L=1, FIRST READ 0'S, THEN ALWAYS
 /ALL 1'S

1637 5257
 1640 4261
 1641 2033
 1642 5254
 1643 2027
 1644 5650
 1645 1253
 1646 3651
 1647 5650

CNSTK,

```

JMP POS+3
JMS ALL0
ISZ NOSTAK
JMP POS
ISZ LOOP
JMP I XNOM
TAD TTR
DCA I XBELL
JMP I XBELL

```

/L=0, ALWAYS READ ALL 1'S
 /READ ALL 0 FROM 1ST
 /DONE ALL MISSING IF SKIP
 /READ ALL 1'S FROM HERE ON
 /DONE LOOPING IF SKIP

/REPEAT

/RESTORE TLS
 /RING BELL

1650 1603
 1651 1561
 1652 1560
 1653 6046

```

/
XJOM,
XBELL,
YBELL,
TTR,
/

```

```

NOMEM+3
BELL+1
BELL
TLS

```

1654 1307
 1655 1046
 1656 3307
 1657 4306
 1660 5241

POS,

```

TAD CDF1S
TAD K10
DCA CDF1S
JMS ALL1
JMP CNSTK

```

/DF PLUS 1

/READ ALL 1'S
 /CHECK DONE

```

/
/Routine TO READ ALL 0'S.
/
1661 0000      ALL0, 0
1662 6201      CDF0S, CDF 00      /SET DF TO 1ST MISSING
1663 7240      CLA CMA
1664 3010      DCA 10      /10 AND 11 USED FOR ADDRESS
1665 7040      CMA
1666 3011      DCA 11
1667 3002      DCA 2      /USE AS COUNTER
1670 7040      CMA
1671 3410      DCA I 10      /WRITE 1'S INTO NON-EXIS-
                               /TENT FIELD.

1672 2002      ISZ 2
1673 5270      JMP , -3
1674 1411      TAD I 11      /READ NON-EXIST. FIELD
1675 7650      SNA CLA      /SHOULD = 0000
1676 5301      JMP , +3
1677 1011      TAD 11
1700 7402      E54, HLT      /ERROR, AN EXISTING FIELD
                               /WAS REFERENCED, C(AC)=
                               /ADDRESS REFERENCED

1701 2002      ISZ 2
1702 5274      JMP E54-4      /READ NEXV

/
1703 6201      DDF0S, CDF 00
1704 6202      CIF 00
1705 5661      JMP I ALL0      /EXIT
/

```

```

/ROUTINE TO READ ALL 1'S
/
1706 0000
1707 6201
1710 7240
1711 3010
1712 7040
1713 3011
1714 3002
1715 3410
1716 2002
1717 5315
1720 1411
1721 7040
1722 7450
1723 5327
1724 7040
1725 7402
1726 7200
1727 2002
1730 5320
1731 6201
1732 6202
1733 5706

ALL1, 0
CDF15, CDF 00 /SET DF TO MISSING FIELD
          CLA CMA
          DCA 10 /10 AND 11 USED FOR ADDRESSING
          CMA
          DCA 11
          DCA 2 /USED AS COUNTER
          DCA I 10 /WRITE 0'S
          ISZ 2
          JMP ,-2
          TAD I 11 /READ 1'S FROM NO MEMORY
          CMA
          SNA
          JMP ,+4
          CMA
E57, HLT /7777 NOT READ, C(AC)= DATA
          /READ, C(11)= ADDRESS,
          CLA
          ISZ 2
          JMP E57-5
          CDF 00
          CIF 00
          JMP I ALL1 /EXIT
/

```

```

/READ SR9-11
/
1734 0000      NSTKS, 0
1735 7604          LAS
1736 0045          AND K7
1737 7041          CIA
1740 3031          DCA STKS
1741 5734          JMP I NSTKS
/
/SET TTY FLAG
/
1742 0000      TFLG, 0
1743 7200          CLA
1744 0015          AND 15
1745 1344          TAD ,-1
1746 6046          TLS
1747 6041          TSF
1750 5347          JMP ,-1
1751 7200          CLA
1752 5742          JMP I TFLG      /EXIT
/
$

```

THERE ARE NO ERRORS

SYMBOL TABLE

ALLO	1661
ALLO	1706
REGIN	0200
RELL	1560
COE	6201
CHENS	1662
CHENS	1707
CHOF	1136
CIF	6222
CIF1	0704
CIF2	0727
CIF3	0752
CIF4	1000
CIF5	1023
CIF6	1046
CIF7	1071
CKAC	1226
CNS TK	1641
CSRA	1553
DAT	0032
DCAI	0601
DFLO	0607
DF0	1446
DF0	0202
DF1	0226
DF2	0237
DF3	0254
DF4	0265
DF5	0302
DF6	0313
DF7	0211
D, AUTO	1516
DONE	1703
ENTER	1200
EXFD	1316
EXFLD	1302
E1	0206
E10	0351
E11	0360
E12	0410
E13	0417
E14	0427
E15	0436
E16	0452
E17	0461
E18	0471
E19	0500
E2	0217
E20	0514
E21	0523
E22	0533
E23	0542
E24	0653

SYMBOL TABLE

E25	0710
E26	0717
E27	0733
E28	0742
E29	0756
E3	0234
E30	0765
E31	1004
E32	1013
E33	1027
E34	1036
E35	1052
E36	1061
E37	1075
E38	1104
E4	0245
E40	1175
E41	1203
E42	1221
E43	1235
E44	1306
E45	1312
E45A	1420
E46	1522
E47	1525
E48	1530
E49	1533
E5	0262
E50	1536
E51	1541
E52	1544
E53	1547
E54	1700
E57	1725
E6	0273
E7	0310
E8	0321
E9	0341
FILDX	1515
GOTO2	1512
HNTS	2667
I0SF	0656
I02	2334
I01	2343
I02	2422
I03	0421
I04	2444
I05	0463
I06	0506
I07	2525
ISZ0	0021
JMPI2	2222
JMP2	2126

SYMBOL TABLE

KCDF	0040
KCF1	0042
KCIF	0041
KE42	2236
KE40M	0035
KFLD0	0107
KHIT	0037
KJMP	0103
KNTR	0104
KRTN	0110
KXFLD	0102
K1	0044
K10	0046
K20	0105
K7	0045
K7S	0070
K7000	0050
K7707	0051
K7717	0057
K7727	0056
K7737	0055
K7744	0073
K7747	0054
K7757	0053
K7766	0071
K7767	0052
K7770	0066
K7771	0065
K7772	0064
K7773	0063
K7774	0062
K7775	0061
K7776	0060
K7777	0047
LOOP	0027
MOVE	1463
NDF	0030
NEWDF	1440
NOFLD	0034
NOMEM	1600
NOSTAK	0033
NSTKS	1734
OKF1	0722
OKF2	0745
OKF3	0770
OKF4	1016
OKF5	1041
OKF6	1064
OKF7	1107
OK1	0222
OK2	0250
OK3	0276
OK4	0324

SYMBOL TABLE

OK5	1362
OK6	1440
OK7	1502
OK8	1544
POINT	1067
POS	1654
RDF	6214
RIR	6234
RIF	6224
RMF	6244
RTRN	1427
SFT3	1400
STDF	1171
STKS	0031
STRMF	1151
TADI	0622
TADTD	1432
TFLD	0630
TFLG	1742
TRANS	1321
TRELD	1337
TRMF	1112
TIR	1653
XADTD	1026
XBELL	1652
XBGV	1565
XELL	1651
XFD	0043
XFIB	0111
XMFM	1566
XNDM	1650
XRANS	0025
XRMF	0024
XSTKS	0023
XTDF	0100
XTDF1	0101
XTFLG	0022

SYMBOL TABLE

JMP1	0020
ISZM	0021
XTFLG	0022
XSTKR	0023
XRM	0024
XRANS	0025
XAHIT	0026
LOOP	0027
NDF	0030
STKS	0031
DAT	0032
NOSTAK	0033
NOFLD	0034
KE40M	0035
KE41	0036
KHL	0037
KCDF	0040
KCF	0041
KCF1	0042
XFD	0043
K1	0044
K7	0045
K10	0046
K7777	0050
K7730	0050
K7737	0051
K7767	0052
K7757	0053
K7747	0054
K7737	0055
K7727	0056
K7717	0057
K7776	0060
K7775	0061
K7774	0062
K7773	0063
K7772	0064
K7771	0065
K7770	0066
POINT	0067
K7S	0070
K7766	0071
K7744	0073
XTDF	0100
XTDF1	0101
KXFLD	0102
KJMP	0103
KNTR	0104
K20	0105
JMP2	0106
KFLD0	0107
KRTN	0110
XFB	0111

SYMBOL TABLE

REGIA	0200
DF0	0202
F1	0206
DF7	0211
E2	0217
OK1	0222
DF1	0226
F3	0234
DF2	0237
E4	0245
OK2	0250
DF3	0254
F5	0262
DF4	0265
E6	0273
OK3	0276
DF5	0302
E7	0310
DF6	0313
E8	0321
OK4	0324
IB0	0334
E9	0341
IB1	0343
F10	0351
E11	0360
OK5	0362
IB2	0402
E12	0410
E13	0417
IB3	0421
E14	0427
E15	0436
OK6	0440
IB4	0444
E16	0452
E17	0461
IB5	0463
E18	0471
E19	0500
OK7	0502
IB6	0506
E20	0514
E21	0523
IB7	0525
E22	0533
E23	0542
OK8	0544
DCAI	0601
DFLD	0607
TADI	0622
TFLD	0630
E24	0653

SYMBOL TABLE

IBSF	0656
HLTS	0667
CIF1	0704
E25	0710
E26	0717
OKF1	0722
CIF2	0727
E27	0733
E28	0742
OKF2	0745
CIF3	0752
E29	0756
E30	0765
OKF3	0770
CIF4	1000
E31	1004
E32	1013
OKF4	1016
CIF5	1023
E33	1027
E34	1036
OKF5	1041
CIF6	1046
E35	1052
E36	1061
OKF6	1064
CIF7	1071
E37	1075
E38	1104
OKF7	1107
TRMF	1112
CHDF	1136
STRMF	1151
STDF	1171
E40	1175
ENTER	1200
E41	1203
E42	1221
CKPC	1226
E43	1235
EXFLD	1302
E44	1306
E45	1312
EXFD	1316
TRANS	1321
TRFLD	1337
SFIB	1400
E45A	1420
RTRN	1427
TAUTO	1432
NEWDF	1440
DFN	1446
MOVE	1463

SYMBOL TABLE

GDT00	1510
FILD0	1515
DOAUTO	1516
E46	1522
E47	1525
E48	1530
E49	1533
E50	1536
E51	1541
E52	1544
E53	1547
GSP8	1553
RELL	1560
XBGN	1565
XMEM	1566
NOMEM	1600
CNSTK	1641
XNOM	1650
XELL	1651
XBFL	1652
TTR	1653
POS	1654
ALL0	1661
CDF05	1662
E54	1700
DONE0	1703
ALL1	1706
CDF15	1707
E57	1725
NSTKS	1734
TFLG	1742
CDF	6201
CIF	6202
PDF	6214
RIF	6224
RIR	6234
RMF	6244