

1. IDENTIFICATION
- 1.1 Maindec-801-1
- 1.2 PDP-8 Instruction Test Part 1
- 1.3 May 14, 1963



## 2. ABSTRACT

This program is a minimal test of the memory reference instructions, operate instructions, interrupt mode and keyboard printer. This test should be used when the state of the processor prevents reading of more advanced diagnostic programs. It is simply a "go-no go" test of the instructions and is not meant to be diagnostic in nature.

## 3. REQUIREMENTS

## 3.1 Storage

Memory locations  $20_8 - 1177_8$

## 3.2 Subprograms and/or Subroutines

High RIM Loader

## 3.3 Equipment

PDP-8 Processor, Keyboard Reader, and Teleprinter

## 4. USAGE

## 4.1 Loading

4.1.1 RIM Loader. If the RIM Loader beginning at 7756 is in memory go to section 4.1.2, otherwise load the RIM Loader via the SWITCH REGISTER.

PDP-8 Instruction Test Part 1 may now be loaded as follows:

4.1.2 Set 7756 in the SWITCH REGISTER.

4.1.3 Press LOAD address key.

4.1.4 Place Instruction Test Part 1 in the keyboard reader.

4.1.5 Press START key on the operators console.

4.1.6 Engage the keyboard reader.

4.2 Calling Sequence (Not Available)

4.3 Switch Settings

Set the SWITCH REGISTER keys to 7777 when starting the program.

4.4 Start-Up and/or Entry

The starting address of the PDP-8 Part 1 Instruction Test is  $0200_8$ .

Set 0200 in the SWITCH REGISTER.

Press the LOAD address key.

Set the SWITCH REGISTER keys to 7777.

Press the START key.

Should STOP AT PC 201 AC = 0 PRESS CONT.  
 " " " PC 203 AC = -1 " "  
 " " " PC 206 AC = 0 " "  
 SHOULD RUN

## 4.5 Errors in Usage

Errors detected by the program set the processor to a halt, with the exception of a TTY printer error and three visual inspection halts.

Each test has its own error halt address.

Each halt in the listing has a description to which the user is directed should any of the halts occur.

## Error Halt List:

0200	hlt	test
0202	osr	test
0205	cla	test
0207	skp	test
0212	sma	test
0216	sma	test
0221	spa	test
0225	spa	test
0230	sza	test
0234	sza	test
0237	sna	test
0243	sna	test
0245	szl	test
0251	stl	test
0254	snl	test
0260	cfl	test
0264	snl	test
0270	cml	test
0274	cml	test
0300	cma	test
0304	iac	test
0311	cma	test
0316	sta	test
0322	cia	test
0326	link	test
0335	and	test
0341	and	test
0347	and	test
0353	and	test
0357	tad	test
0364	tad	test
0404	tad	test
0413	tad	test
0417	tad	test
0423	dca	test
0427	dca	test
0436	dca	test
0442	isz	test
0447	isz	test
0453	jmp	test

0460	jms	test
0464	jms	test
0472	jms	test
0504	jms	test
0513	and	indirect addressing test
0517	jmp	indirect addressing test
0524	jms	indirect addressing test
0531	and	page zero addressing test
0533	jmp	page zero addressing test
0540	and	indirect page zero addressing test
0544	ral	test
0552	ral	test
0554	ral	test
0563	ral	test
0605	ral	test
0611	rtl	test
0617	rtl	test
0624	rtl	test
0630	rtl	test
0636	rar	test
0644	rar	test
0651	rar	test
0655	rar	test
0663	rtr	test
0671	rtr	test
0676	rtr	test
0702	rtr	test
0720	autoindexing	test

#### 4.6 Recovery from such Errors

Press CONTINUE key to continue to the next test in sequence. Deposit JMP instructions at the error halt address and normal test exit address to enter a scope mode. Upon completion of the scope mode, the original contents of the addresses changed must be restored.

#### 5. RESTRICTIONS (None)

#### 6. DESCRIPTION

##### 6.1 Discussion

The PDP-8 Instruction Test Part 1 is a minimal test of the memory reference instructions, operate instructions, interrupt mode, and keyboard printer.

An instruction and its hardware are tested by comparing a test pattern with the results of an operation. If the comparison is true, we exit to the next test in sequence. If false, we halt at a pre-determined error stop. At this error stop in the listing, an explanation of the error will be found. The correct contents of the accumulator will also be contained on the listing where applicable. If the instruction under test is a decision type, a test pattern is tested.

The test starts at memory address 0200<sub>g</sub>. Memory addresses 0200<sub>g</sub>, 0202<sub>g</sub>, and 0205<sub>g</sub>, are visual inspection halts. Upon completion of the visual inspection halts, the program has no other non-error halts. The program has two sets of typeouts:

?@?      This typeout is a minimal keyboard printer test.

1          This typeout shows test completion.

The Teletype could be turned off after first pass. The program will loop between 0206<sub>g</sub> and 1117<sub>g</sub> until an error occurs. The program is assembled in RIM format due to the minimal use of hardware by the RIM Loader.

## 6.2      Example

An example of a particular test, in this case testing the link, follows:

Set link to a 1.

Clear link to a 0.

Skip to next test if link is equal to a 0.

If link equals a 1, halt.

## 7.      METHODS

See section 6.

## 8.      FORMAT (Not Applicable)

## 9.      EXECUTION TIME

1 second.

## 10.     PROGRAM

### 10.1    Core Map (None)

### 10.2    Dimension List (None)

### 10.3    Macro, Parameter, and Variable Lists (None)

10.4 Program Listing

/INSTRUCTION TEST PDP-8 PART 1

```

                                *20
                                /K TABLE
0020 0000 K0000, 0000
0021 0001 K0001, 0001
0022 0002 K0002, 0002
0023 0004 K0004, 0004
0024 0010 K0010, 0010
0025 0020 K0020, 0020
0026 0040 K0040, 0040
0027 0100 K0100, 0100
0030 0200 K0200, 0200
0031 0400 K0400, 0400
0032 1000 K1000, 1000
0033 2000 K2000, 2000
0034 4000 K4000, 4000
0035 7776 K7776, 7776
0036 7775 K7775, 7775
0037 7773 K7773, 7773
0040 7767 K7767, 7767
0041 7757 K7757, 7757
0042 7737 K7737, 7737
0043 7677 K7677, 7677
0044 7577 K7577, 7577
0045 7377 K7377, 7377
0046 6777 K6777, 6777
0047 5777 K5777, 5777
0050 3777 K3777, 3777
0051 7777 K7777, 7777
0052 5252 K5252, 5252
0053 2525 K2525, 2525

                                *134
0134 5535 ZIND, JMP I IRJMP
0135 0534 IRJMP, TANDIZ /INDIRECT ADDRESS

0136 0051 IZCON, K7777 /INDIRECT ADDRESS

                                STA=7240
                                /TO BE TAKEN OUT LATER NOT DEFINED IN ASSEMBLER
                                /AT THE PRESENT TIME

                                *0137
0137 1016 IIONEX, TION1 /JUMP TO TION1
0140 1032 IIONE, COMP /JMP TO COMP
0141 1031 CMPDMA, CLRMA
0142 1055 IIONE1, PCMB
0143 1103 IOFHLT, IOFERR

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0200	7402	x200 THALT,	HLT	/HALT TEST /SET SR TO ALL ONES AND RESTART
0201	7404	TOSR,	OSR	
0202	7402	HLT		/AC SHOULD EQUAL ALL ONES /RESTART
0203	7404	TCIA,	OSR	
0204	7200	CLA		
0205	7402	HLT		/AC SHOULD EQUAL ALL ZEROS /RESTART
0206	7410	TSKP,	SKP	
0207	7402	HLT		/SKP FAILED
0210	7604	TSMA,	CLA OSR	/AC EQUALS ALL ONES
0211	7500	SMA		
0212	7402	HLT		/SMA FAILED TO SKIP
0213	7200	TSMAF,	CLA	/AC EQUALS ALL ZEROS
0214	7500	SMA		
0215	7410	SKP		
0216	7402	HLT		/SMA SHOULD NOT HAVE SKIPPED
0217	7200	TSPA,	CLA	/AC EQUALS ALL ZEROS
0220	7510	SPA		
0221	7402	HLT		/SPA FAILED TO SKIP
0222	7604	TSPAF,	CLA OSR	/AC EQUALS ALL ONES
0223	7510	SPA		
0224	7410	SKP		
0225	7402	HLT		/SPA SHOULD NOT HAVE SKIPPED
0226	7300	TS7A,	CLA CLL	/AC EQUALS ALL ZEROS - LINK EQUALS ZERO
0227	7440	SZA		
0230	7402	HLT		/SZA FAILED TO SKIP
0231	7604	TS7AF,	CLA OSR	/AC EQUALS ALL ONES
0232	7440	SZA		
0233	7410	SKP		
0234	7402	HLT		/SZA SHOULD NOT HAVE SKIPPED
0235	7604	TSNA,	CLA OSR	/AC EQUALS ALL ONES
0236	7450	SNA		
0237	7402	HLT		/SNA FAILED TO SKIP
0240	7200	TSNAF,	CLA	/AC EQUALS ALL ZEROS
0241	7450	SNA		
0242	7410	SKP		
0243	7402	HLT		/SNA SHOULD NOT HAVE SKIPPED
0244	7430	TS7L,	SZL	/LINK SHOULD BE EQUAL TO ZERO
0245	7402	HLT		/S7L FAILED TO SKIP



0246	7120	TSTL,	STL	/STL LINK TO A ONE
0247	7430	TS7LF,	SZL	
0250	7410	SKP		/LINK EQUALS A ONE SZL SHOULD NOT HAVE
0251	7402	HLT		/SKIPPED
				/LINK EQUALS A ZERO STL DID NOT SET LINK
0252	7120	TSNL,	STL	/STL LINK TO A ONE
0253	7420	SNL		
0254	7402	HLT		/SNL FAILED TO SKIP
0255	7120	TCLL,	STL	/STL LINK TO A ONE
0256	7100	CLL		/CLL LINK TO A ZERO
0257	7430	SZL		
0260	7402	HLT		/CLL DID NOT CLEAR LINK
0261	7100	TSNLF,	CLL	/CLL LINK TO A ZERO
0262	7420	SNL		
0263	7410	SKP		/SNL SHOULD NOT HAVE SKIPPED
0264	7402	HLT		
0265	7100	TCML,	CLL	/CLL LINK TO A ZERO
0266	7020	CML		
0267	7420	SNL		/CML DID NOT COMPLEMENT LINK TO A ONE
0270	7402	HLT		
0271	7120	TCMLF,	STL	/STL LINK TO A ONE
0272	7020	CML		
0273	7430	SZL		/CML DID NOT COMPLEMENT LINK TO A ZERO
0274	7402	HLT		
0275	7604	TCMA,	CLA OSR	/AC EQUALS ALL ONES
0276	7040	CMA		
0277	7440	SZA		/CMA DID NOT COMPLEMENT AC TO ALL ZEROS
0300	7402	HLT		
0301	7604	TIAC,	CLA OSR	/AC EQUALS ALL ONES
0302	7001	IAC		/INCREMENT AC PLUS ONE
0303	7440	SZA		
0304	7402	HLT		/IAC DID NOT INCREMENT AC TO ALL ZEROS
0305	7200	TCMAF,	CLA	/AC EQUALS ALL ZEROS
0306	7040	CMA		
0307	7001	IAC		/IAC AC TO ALL ZEROS
0310	7440	SZA		
0311	7402	HLT		/CMA DID NOT COMPLEMENT AC TO ALL ONES
0312	7200	TSTA,	CLA	/AC EQUALS ALL ZEROS
0313	7240	STA		
0314	7040	CMA		/COMPLEMENT ALL ONES TO ZEROS
0315	7440	SZA		
0316	7402	HLT		/STA DID NOT SET AC TO ALL ONES

0317	7200	TCIA,	CLA	/AC EQUALS ALL ZEROS
0320	7041	CIA		
0321	7440	SZA		
0322	7402	HLT		/CIA DID NOT COMPLEMENT AC TO ALL ONES /AND OR DID NOT INCREMENT AC TO ALL ZEROS
0323	7340	TLINK,	7340	/STA CLL=7340, AC EQUALS ALL ONES
0324	7001	IAC		/INCREMENT AC PLUS ONE
0325	7420	SNL		
0326	7402	HLT		/LINK DID NOT EQUAL A ONE
0327	7410	SKP		
0330	7777	C7777,	7777	/OCTAL CONSTANT
0331	7240	TAND1,	CLA CMA	/AC EQUALS ALL ONES
0332	0330	AND C7777		
0333	7040	CMA		/COMPLEMENT AC
0334	7440	SZA		
0335	7402	HLT		/AND FAILED ALL ONES TO ALL ONES
0336	7200	TAND2,	CLA	/AC EQUALS ALL ZEROS
0337	0330	AND C7777		
0340	7440	SZA		
0341	7402	HLT		/AND FAILED ALL ONES TO ALL ZEROS
0342	7410	SKP		
0343	0000	C0000,	0000	
0344	7200	TAND3,	CLA	/AC EQUALS ALL ZEROS
0345	0343	AND C0000		
0346	7440	SZA		
0347	7402	HLT		/AND FAILED ALL ZEROS TO ALL ZEROS
0350	7240	TAND4,	CLA CMA	/AC EQUALS ALL ONES
0351	0343	AND C0000		
0352	7440	SZA		
0353	7402	HLT		/AND FAILED ALL ZEROS TO ALL ONES
0354	7200	TTAD1,	CLA	/AC EQUALS ALL ZEROS
0355	1343	TAD C0000		
0356	7440	SZA		
0357	7402	HLT		/TAD FAILED ALL ZEROS TO ALL ZEROS
0360	7240	TTAD2,	CLA CMA	/AC EQUALS ALL ONES
0361	1343	TAD C0000		
0362	7040	CMA		/COMPLEMENT AC
0363	7440	SZA		
0364	7402	HLT		/TAD FAILED ALL ZEROS TO ALL ONES
0365	7000	NOP		
0366	7000	NOP		
0367	7000	NOP		
0370	7000	NOP		
0371	7000	NOP		
0372	7000	NOP		
0373	7000	NOP		
0374	7000	NOP		
0375	7000	NOP		
0376	7000	NOP		
0377	7000	NOP		

0400	7200	TTAD3,	CLA	/AC EQUALS ALL ZEROS
0401	1206	TAD	C7777A	
0402	7040	CMA		/COMPLEMENT AC
0403	7440	SZA		
0404	7402	HLT		/TAD FAILED ALL ONES TO ALL ZEROS
0405	7410	SKP		
0406	7777	C7777A,	7777	/OCTAL CONSTANT
0407	7240	TTAD4,	CLA CMA	/AC EQUALS ALL ONES
0410	7100	CLL		/CLEAR LINK
0411	1206	TAD	C7777A	
0412	7420	SNL		
0413	7402	HLT		/TAD FAILED LINK SHOULD EQUAL ONE
0414	7001	IAC		/INCREMENT AC PLUS ONE
0415	7040	CMA		/COMPLEMENT AC
0416	7440	SZA		
0417	7402	HLT		/TAD FAILED TO FULL ADD AND CARRY
				/AC DID NOT EQUAL A MINUS TWO
0420	7240	TDCA1,	CLA CMA	/AC EQUALS ALL ONES
0421	3231	DCA	U0000	
0422	7440	SZA		
0423	7402	HLT		/DCA FAILED TO CLEAR AC
0424	1231	TAD	U0000	
0425	7040	CMA		/COMPLEMENT AC
0426	7440	SZA		
0427	7402	HLT		/DCA FAILED TO STORE ONES AT U0000
0430	7410	SKP		
0431	0000	U0000,	0000	/OCTAL CONSTANT UTILITY
0432	7200	TDCA2,	CLA	/AC EQUALS ALL ZEROS
0433	3240	DCA	U7777	
0434	1240	TAD	U7777	
0435	7440	SZA		
0436	7402	HLT		/DCA FAILED TO STORE ZEROS AT U7777
0437	7410	SKP		
0440	7777	U7777,	7777	/OCTAL CONSTANT UTILITY
0441	2244	TISZ1,	ISZ UX7777	
0442	7402	HLT		/ISZ FAILED TO INCREMENT UX7777
0443	7410	SKP		
0444	7777	UX7777,	7777	/OCTAL CONSTANT UTILITY
0445	2251	TISZ2,	ISZ UX0000	
0446	7410	SKP		
0447	7402	HLT		/ISZ SHOULD NOT HAVE SKIPPED
0450	7410	SKP		
0451	0000	UX0000,	0000	/OCTAL CONSTANT UTILITY
0452	5255	TJMP,	JMP DIRECT	
0453	7402	HLT		/JMP DIRECT FAILED TO JUMP
0454	7410	SKIP,	SKP	
0455	5254	DIRECT,	JMP SKIP	

0456	7240	TJMS,	CLA CMA	/AC EQUALS ALL ONES
0457	4261	JMS RJMP		
0460	7402	HLT		/JMS IR DECODE FAILED
0461	0000	RJMP,	0000	/TAD OCCURS ON COUNT PC FAILURE
0462	7001	IAC		
0463	7440	SZA		
0464	7402	HLT		/JMS COUNT PC FAILED
0465	4266	TJMS1,	JMS RJMP1	
0466	0000	RJMP1,	0000	/PC JAM THE MB FAILED RJMP1 EQUALS A /ONE IN BIT ELEVEN ONLY /AC EQUALS ALL ONES
0467	7240	CLA CMA		
0470	1266	TAD RJMP1		
0471	7450	SNA		
0472	7402	HLT		/JMS PC JAM THE MB FAILED
0473	7410	SKP		
0474	0475	UJMS2,	TJMS2	/UJMS2 EQUAL TO ADDRESS TJMS2
0475	4276	TJMS2,	JMS RJMS2	
0476	0000	RJMS2,	0000	/OCTAL CONSTANT UTILITY
0477	7200	CLA		
0500	1274	TAD UJMS2		
0501	7041	CMA IAC		
0502	1276	TAD RJMS2		
0503	7450	SNA		
0504	7402	HLT		/JMS COUNT MR FAILED RJMS2 /SHOULD NOT HAVE EQUALED TJMS2
0505	7410	SKP		
0506	0330	INDR7,	C7777	/INDIRECT ADDRESS
0507	7240	TINDR,	CLA CMA	/AC EQUALS ALL ONES
0510	0706	AND I INDR7		
0511	7040	CMA		/COMPLEMENT AC
0512	7440	SZA		
0513	7402	HLT		/INDIRECT ADDRESSING FAILED /ON A NON JMP OPERATION
0514	5716	TJMPI,	JMP I INDJMP	
0515	5320	JMPIND,	JMP TJMSI	/INDIRECT ADDRESS
0516	0515	INDJMP,	JMPIND	
0517	7402	HLT		/INDIRECT ADDRESSING FAILED ON A /JMP OPERATION
0520	4723	TJMSI,	JMS I INDJMS	
0521	0000	JMSIND,	0000	/JMSIND SHOULD EQUAL TJMSI PLUS ONE
0522	5325	JMP TAND7		
0523	0521	INDJMS,	JMSIND	/INDIRECT ADDRESS
0524	7402	HLT		/INDIRECT ADDRESSING FAILED /DURING A JMS OPERATION
0525	7240	TANDZ,	CLA CMA	/AC EQUALS ALL ONES
0526	0051	AND 7 K777		
0527	7040	CMA		
0530	7440	SZA		
0531	7402	HLT		/PAGE ZERO ADDRESSING FAILED /ON AN AND OPERATION

0532	5134	TJMPZ,	JMP Z ZIND	
0533	7402	HLT		/PAGE ZERO ADDRESSING FAILED /ON A JUMP OPERATION
0534	7240	TANDIZ,	CLA CMA	/AC EQUALS ALL ONES
0535	0536	AND I Z IZCON		
0536	7040	CMA		/COMPLEMENT AC
0537	7440	SZA		
0540	7402	HLT		/PAGE ZERO INDIRECT ADDRESSING /FAILED ON AN AND OPERATION
0541	7300	TRAL,	CLA CLL	/CLEAR LINK AND AC
0542	7004	RAL		
0543	7440	SZA		
0544	7402	HLT		/RAL FAILED A BIT WAS PICKED UP
0545	7240	TRAL1,	CLA CMA	/AC EQUALS ALL ONES
0546	7120	STL		/LINK EQUALS A ONE
0547	7004	RAL		
0550	7040	CMA		
0551	7440	SZA		
0552	7402	HLT		/RAL FAILED A BIT WAS DROPPED
0553	7420	SNL		
0554	7402	HLT		/RAL FAILED LINK DROPPED A BIT
0555	7320	TRAL2,	CLA STL	/CLEAR AC AND SET LINK
0556	1052	TAD 7 K5252		/PATTERN TO BE ROTATED
0557	7004	RAL		
0560	1052	TAD 7 K5252		
0561	7040	CMA		
0562	7440	SZA		
0563	7402	HLT		/RAL FAILED
0564	2231	ISZ U0000		/HOUSE KEEP
0565	7000	NOP		
0566	2240	ISZ U7777		/HOUSE KEEP
0567	7000	NOP		
0570	7240	STA		/HOUSE KEEP
0571	3244	DCA UX7777		/HOUSE KEEP
0572	3251	DCA UX0000		/HOUSE KEEP
0573	7000	NOP		
0574	7000	NOP		
0575	7000	NOP		
0576	7000	NOP		
0577	7300	TRAL3,	CLA CLL	/CLEAR LINK AND AC
0600	1053	TAD 7 K2525		/PATTERN TO BE ROTATED
0601	7004	RAL		
0602	1053	TAD 7 K2525		
0603	7040	CMA		
0604	7440	SZA		
0605	7402	HLT		/RAL FAILED
0606	7300	TRTL,	CLA CLL	/CLEAR LINK AND AC
0607	7006	RTL		
0610	7440	SZA		
0611	7402	HLT		/RTL FAILED A BIT WAS PICKED UP

0612	7240	TRTL1,	CLA CMA	/AC EQUALS ALL ONES
0613	7120	STL		/LINK EQUALS A ONE
0614	7004	RAL		
0615	7040	CMA		
0616	7460	SZA SNL		
0617	7402	HLT		/RTL FAILED A BIT WAS DROPPED
0620	7320	TRTL2,	CLA STL	/CLEAR AC AND SET LINK
0621	1052	TAD 7 K5252		/PATTERN TO BE ROTATED
0622	7006	RTL		
0623	7430	SZL		
0624	7402	HLT		/LINK FAILED ON RTL
0625	1232	TAD RTLPAT		/COMPLEMENT OF ROTATED PATTERN
0626	7040	CMA		
0627	7440	SZA		
0630	7402	HLT		/RTL FAILED
0631	7410	SKP		
0632	2524	RTIPAT,	2524	/OCTAL CONSTANT
0633	7300	TRAR,	CLA CLL	/CLEAR LINK AND AC
0634	7010	RAR		
0635	7440	SZA		
0636	7402	HLT		/RAR FAILED A BIT WAS PICKED UP
0637	7240	TRAR1,	CLA CMA	/AC EQUALS ALL ONES
0640	7120	STL		
0641	7010	RAR		
0642	7040	CMA		
0643	7460	SZA SNL		
0644	7402	HLT		/RAR FAILED A BIT WAS DROPPED
0645	7320	TRAR2,	CLA STL	/CLEAR AC AND SET LINK
0646	1052	TAD 7 K5252		/PATTERN TO BE ROTATED
0647	7010	RAR		
0650	7430	SZL		
0651	7402	HLT		/LINK FAILED ON RAR
0652	1257	TAD RARPAT		/COMPLEMENT OF ROTATED PATTERN
0653	7040	CMA		
0654	7440	SZA		
0655	7402	HLT		/RAR FAILED
0656	7410	SKP		
0657	1252	RARPAT,	1252	/OCTAL CONSTANT
0660	7300	TRTR,	CLA CLL	/CLEAR AC AND LINK
0661	7012	RTR		
0662	7440	SZA		
0663	7402	HLT		/RTR FAILED A BIT WAS PICKED UP
0664	7240	TRTR1,	CLA CMA	/AC EQUALS ALL ONES
0665	7120	STL		
0666	7012	RTR		
0667	7040	CMA		
0670	7460	SZA SNL		
0671	7402	HLT		/RTR FAILED A BIT WAS DROPPED

0672	7320	TRTR2,	CLA STL	/CLEAR AC AND SET LIN
0673	1052	TAD 7	K5252	/PATTERN TO BE ROTATED
0674	7012	RTR		
0675	7420	SNL		
0676	7402	HLT		/LINK FAILED ON RTR
0677	1304	TAD	RTRPAT	/COMPLEMENT OF ROTATED PATTERN
0700	7040	CMA		
0701	7440	SZA		
0702	7402	HLT		/RTR FAILED
0703	5307	JMP	SETUP	
0704	4525	RTRPAT,	4525	/OCTAL CONSTANT
0705	0705	TAUTOX,	TAUTOX	
0706	0000	XUREG,	0000	
0707	7200	SETUP,	CLA	/CLEAR AC
0710	1305	TAD	TAUTOX	
0711	3010	DCA 7	10	/STORE TAUTOX IN INDEX TEN
0712	1052	TAD 7	K5252	
0713	3410	DCA 1 Z	10	/DATA TO BE STORED IN XUREG
0714	1306	TAD	XUREG	
0715	1053	TAD 7	K2525	
0716	7040	CMA		
0717	7440	SZA		
0720	7402	HLT		/AUTO INDEXING FAILED
0721	5333	JMP	TTYCR	
0722	7000	NOP		
0723	7000	NOP		
0724	7000	NOP		
0725	7000	NOP		
0726	7000	NOP		
0727	0215	CRXX,	0215	/CR
0730	0212	LFXX,	0212	/LF
0731	0277	XXX?,	0277	/?
0732	0300	ATXXX,	0300	/→
0733	7200	TTYCR,	CLA	
0734	1327	TAD	CRXX	
0735	7000	NOP		
0736	7000	NOP		
0737	6046	TLS		/PRINT CR
0740	7000	NOP		
0741	7200	TTYLF,	CLA	
0742	1330	TAD	IFXX	
0743	6041	TTYLP1,	TSF	
0744	5343	JMP	TTYLP1	
0745	6046	TLS		/PRINT LF
0746	7000	NOP		
0747	7200	TTY?,	CLA	
0750	1331	TAD	XXX?	
0751	6041	TTYLP2,	TSF	
0752	5351	JMP	TTYLP2	
0753	6046	TLS		/PRINT?
0754	7000	NOP		

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0755 7200 TTYAT,      CLA
0756 1332 TAD ATXXX
0757 6041 TTYLP3,    TSF
0760 5357 JMP TTYLP3

0761 6046 TLS /PRINT →
0762 7000 NOP

0763 7200 TTY?X,      CLA
0764 1331 TAD XXX?
0765 6041 TTYLP4,    TSF
0766 5365 JMP TTYLP4
0767 6046 TLS /PRINT?
0770 6041 LOOPX,    TSF
0771 5370 JMP LOOPX
0772 6032 KCC
0773 7000 NOP
0774 7000 NOP
0775 7000 NOP
0776 7000 NOP
0777 7410 SKP

x1000
1000 5537 IONEX,      JMP I Z IIONEX
1001 6002 TION,      IOF /TURN INTERRUPT ENABLE OFF
1002 6042 TCF /CLEAR TTY FLAG
1003 7200 CLA
1004 1200 TAD IONEX
1005 3001 DCA 7 0001 /STORE (IONEX) AT MA ONE
1006 1051 TAD K7777 /RUB OUT
1007 6046 TLS
1010 6041 FLLOOP,    TSF /SKIP ON A TTY FLAG EQUAL TO A ONE
1011 5210 JMP FLLOOP /FLAG LOOP
1012 6001 ION /TURN INTERRUPT ON
1013 7000 NOP
1014 7402 HLT /ZERO THE PC MAY HAVE FAILED
/ON INTERRUPT

1015 5540 IONEX1,     JMP I Z IIONE
1016 6002 TION1,     IOF /TURN INTERRUPT ENABLE OFF
1017 6042 TCF /CLEAR TTY FLAG
1020 7200 CLA
1021 1215 TAD IONEX1
1022 3001 DCA 7 0001 /STORE (IONEX1) AT MA ONE
1023 1051 TAD K7777 /RUB OUT
1024 6046 TLS
1025 6041 FLGOP,    TSF /SKIP ON A TTY FLAG EQUAL TO A ONE
1026 5225 JMP FLGOP /FLAG LOOP
1027 6001 ION /TURN INTERRUPT ON
1030 7200 CLA
1031 7000 CLRMA,    NOP /SHOULD NOT CONTAIN 1031
1032 1231 COMP,    TAD CLRMA
1033 7040 CMA
1034 1141 TAD 7 CMPMA /TAD 1031
1035 7001 IAC
1036 7450 SNA
1037 7402 HLT /ZERO THE MA FAILED ON INTERRUPT
/(CLRMA) EQUATED 1031

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1040 7410      SKP
1041 5542      IONEX2,      JMP I Z IIONF1
1042 6002      TION2,        IOF                /TURN INTERRUPT ENABLE OFF
1043 6042      TCF                /CLEAR TTY FLAG
1044 7200      CLA
1045 1241      TAD IONEX2
1046 3001      DCA 7 0001      /STORE (IONEX2) AT MA ONE
1047 1051      TAD K7777      /RUBOUT
1050 6046      TLS
1051 6041      FLGLP,        TSF                /SKIP ON A TTY FLAG EQUAL TO A ONE
1052 5251      JMP FLGLP          /FLAG LOOP
1053 6001      ION                /TURN INTERRUPT ON
1054 7200      CLA
1055 1000      PCMB,        TAD Z 0000      /((0000) SHOULD EQUAL 1055
1056 7040      CMA
1057 1264      TAD COMP1      /TAD 1055
1060 7001      TAC
1061 7440      SZA
1062 7402      HLT                /PC JAM THE MB FAILED ON INTERRUPT
1063 5266      JMP TIOF          /((0000) DID NOT EQUAL 1055
1064 1055      COMP1,      PCMB

1065 5543      IOFEX,      JMP I Z IOFHLT
1066 6042      TIOF,        TCF                /CLEAR ALL FLAGS
1067 7200      CLA
1070 3000      DCA 7 0000      /CLEAR MA ZERO
1071 1265      TAD IOFEX
1072 3001      DCA 7 0001      /STORE (IOFEX) AT MA ONE
1073 1051      TAD K7777      /RUBOUT
1074 6001      ION                /TURN ON INTERRUPT ENABLE
1075 7000      NOP
1076 6002      IOF                /TURN OFF INTERRUPT ENABLE
1077 6046      TLS
1100 6041      FLGLP1,      TSF                /SKIP ON A TTY FLAG EQUAL TO A ONE
1101 5300      JMP FLGLP1
1102 7410      SKP
1103 7402      IOFERR,      HLT                /IOF FAILED TO TURN OFF INTERRUPT
                                           /ENABLE
                                           /PRINT 1 AND LOOP

1104 7200      CLA
1105 1037      TAD K7773
1106 3002      DCA 7 0002
1107 1327      TAD KSTXX
1110 3010      DCA 7 10
1111 1410      PREND,      TAD I Z 10
1112 6046      TLS
1113 6041      FLAGX,      TSF
1114 5313      JMP FLAGX
1115 2002      ISZ 0002
1116 5325      JMP CONT
1117 5720      STXXX,      JMP I START      /REPEAT TEST 1
1120 0206      START,      0206
1121 0215      CRXXX,      0215
1122 0212      LFXXX,      0212
1123 0061      XXXX1,      0061
1124 7000      NOP
1125 7200      CONT,      CLA
1126 5311      JMP PREND
1127 1117      KSTXX,      STXXX

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*TURN OFF INTERRUPT  
ENABLES FROM  
MPXER, PLT & CTRL  
PLT1 CTRL*

ATYXX	0732	K7773	0037	TRAR1	0637
CLPMA	1031	K7775	0036	TRAR2	0645
CMPCMA	0141	K7776	0035	TRTL	0606
COMP	1032	K7777	0051	TRTL1	0612
COMP1	1064	LFYX	0730	TRTL2	0620
CONT	1125	LFXXX	1122	TRTR	0660
CRXX	0727	LOOPX	0770	TRTR1	0664
CRXXX	1121	PCMB	1055	TRTR2	0672
C0000	0343	PREND	1111	TSKP	0206
C7777	0330	RARPAT	0657	TSMA	0210
C7777A	0406	RJMP	0461	TSMAF	0213
DIRECT	0455	RJMP1	0466	TSNA	0235
FLAGX	1113	RJMS2	0476	TSNAF	0240
FLGLP	1051	RTIPAT	0632	TSNL	0252
FLGLP1	1100	RTRPAT	0704	TSNLF	0261
FLGOP	1025	SETUP	0707	TSPA	0217
FLI OOP	1010	SKIP	0454	TSPA F	0222
IIONE	0140	START	1120	TSTA	0312
IIONEX	0137	STYXX	1117	TSTL	0246
IIONE1	0142	TANDIZ	0534	TS7A	0226
INDJMP	0516	TANDZ	0525	TS7AF	0231
INDJMS	0523	TAND1	0331	TS7L	0244
INDR7	0506	TAND2	0336	TS7LF	0247
IOFERR	1103	TAND3	0344	TTAD1	0354
IOFEX	1065	TAND4	0350	TTAD2	0360
IOFHLT	0143	TAUTOX	0705	TTAD3	0400
IONEX	1000	TCIA	0317	TTAD4	0407
IONEX1	1015	TCI A	0203	TTYAT	0755
IONEX2	1041	TCI L	0255	TTYCR	0733
IRJMP	0135	TCMA	0275	TTYLF	0741
IZCON	0136	TCMAF	0305	TTYLP1	0743
JMPIND	0515	TCML	0265	TTYLP2	0751
JMSIND	0521	TCMLF	0271	TTYLP3	0757
KSTXX	1127	TDCA1	0420	TTYLP4	0765
K0000	0020	TDCA2	0432	TTY?	0747
K0001	0021	THALT	0200	TTY?X	0763
K0002	0022	TIAC	0301	UJMS2	0474
K0004	0023	TINDR	0507	UX0000	0451
K0010	0024	TIOF	1066	UX7777	0444
K0020	0025	TION	1001	U0000	0431
K0040	0026	TION1	1016	U7777	0440
K0100	0027	TION2	1042	XUREG	0706
K0200	0030	TISZ1	0441	XXXX1	1123
K0400	0031	TISZ2	0445	XXX?	0731
K1000	0032	TJMP	0452	ZIND	0134
K2000	0033	TJMPI	0514	D	
K2525	0053	TJMP2	0532		
K3777	0050	TJMS	0456		
K4000	0034	TJMSI	0520		
K5252	0052	TJMS1	0465		
K5777	0047	TJMS2	0475		
K6777	0046	TLINK	0323		
K7377	0045	TOSR	0201		
K7577	0044	TRAL	0541		
K7677	0043	TRAL1	0545		
K7737	0042	TRAL2	0555		
K7757	0041	TRAL3	0577		
K7767	0040	TRAR	0633		