

MAINDEC-9A-D0FA-D

IDENTIFICATION

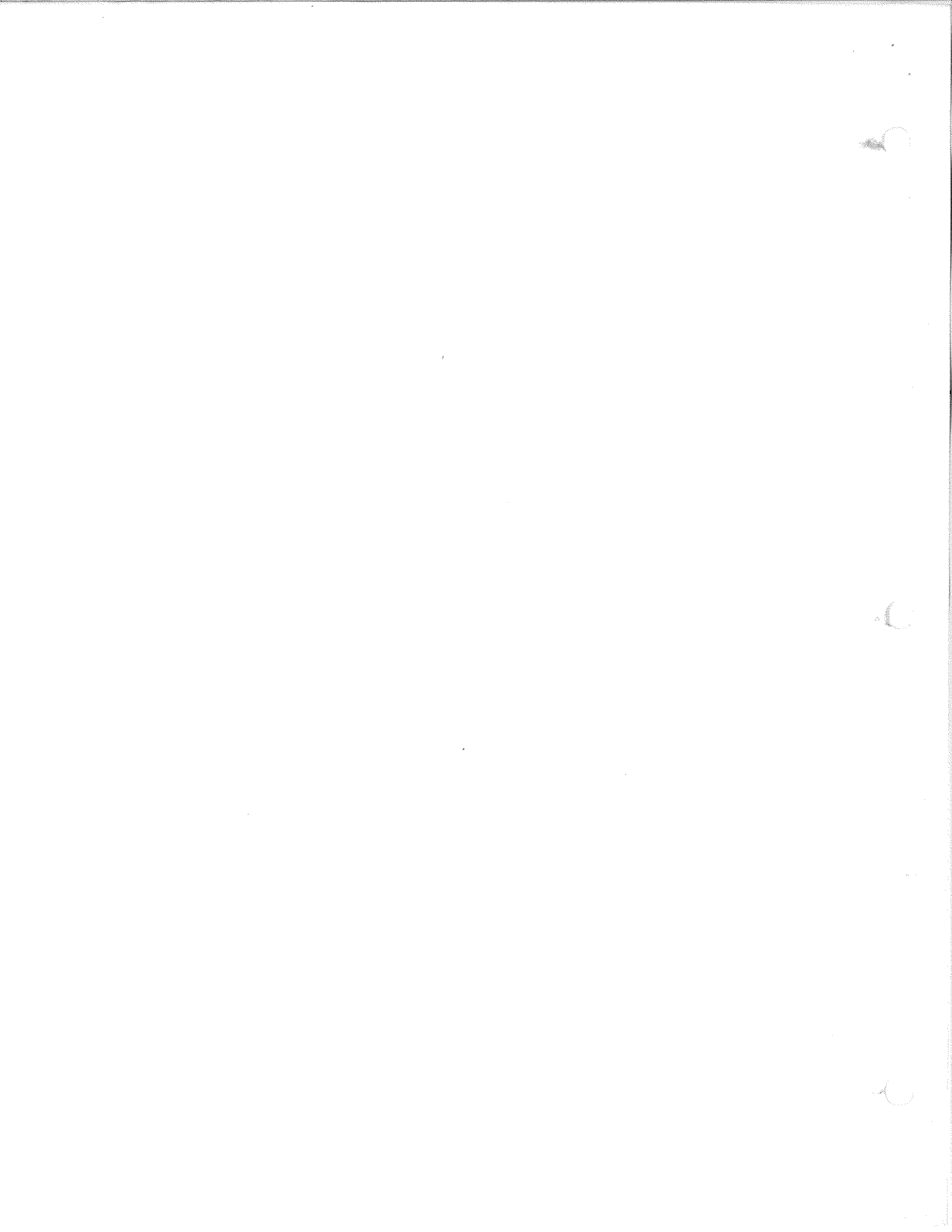
Product Code: MAINDEC-9A-D0FA-D

Product Name: JMS Y - Interrupt Test

Date: May 15, 1967

Maintainer: Diagnostic Group

Author: Edward P. Steinberger



1. ABSTRACT

The JMS Y - Interrupt Test determines if the PDP-9 will complete a JMS Y (where Y is some random value) instruction before it goes into program interrupt. This is done by setting an I/O flag and then transferring control to an ION/JMS Y instruction group (which is located at some random place in memory). The computer should complete the JMS Y instruction before the computer goes into program interrupt. If no error occurs, the ION/JMS Y instruction group is moved to other random memory locations and the test is repeated. Errors are indicated to the operator via the Teletype or error halts.

2. REQUIREMENTS

2.1 Equipment

Standard PDP-9 computer

2.2 Storage

The program uses all of 8K memory for the program or as a test area. The program occupies memory from location 17400 to 17771 and tests all locations below 17377.

2.3 Preliminary Programs

Instruction Test - Parts 1 and 2 (MAINDEC 9A-D01A-D and MAINDEC 9A-D02A-D)

3. LOADING PROCEDURE

3.1 Method

- a. Put HRI tape of program in reader
- b. Set ADDRESS SWITCHES to 17400
- c. Depress and release READIN key.

4. STARTING PROCEDURE

4.1 Control Switch Settings

The following is a table of ACCUMULATOR SWITCH settings and their action on the program:

<u>AC Switch</u>	<u>Set As</u>	<u>Action</u>
0	1	Halt on error
	0	Don't halt on error
1	1	Don't print errors
	0	Print errors

<u>AC Switch</u>	<u>Set As</u>	<u>Action</u>
2	1	Ring bell on error
	0	Ring bell after N passes
3	1	Loop on current Y
	0	Don't loop on current Y
4	1	Loop on current location
	0	Don't loop on current location

N is an arbitrary number (initially 100_g) which is controlled by the LAW-N instruction in location 17400 and may be changed at the operator's discretion.

4.2 Starting Address

The starting address of the program is 17400.

4.3 Program and/or Operator Action

- a. Set ADDRESS SWITCHES to 17400
- b. Set ACCUMULATOR SWITCHES to desired positions (see section 4.1). Normal setting is 500000
- c. Depress I/O RESET
- d. Depress START

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

See section 4.1

5.2 Subroutine Abstracts

None

5.3 Program and/or Operator Action

To put the program in the scope mode, the ACCUMULATOR SWITCH REGISTER should be set to 260000 (don't halt, don't print, bell after N passes, loop on current Y, loop on current location).

6. ERRORS

Unless AC switch 1 is a 1, errors will be printed on the Teletype.

6.1 Error Halts and Description

There is one error halt inside the program at location 17566. Any program diagnosed errors will cause a halt at this location if AC switch 0 is a 1. The program stores HALT in all locations of the test area of memory. If the computer does not go into program interrupt immediately after executing the JMS Y, the computer will halt at location Y + 1.

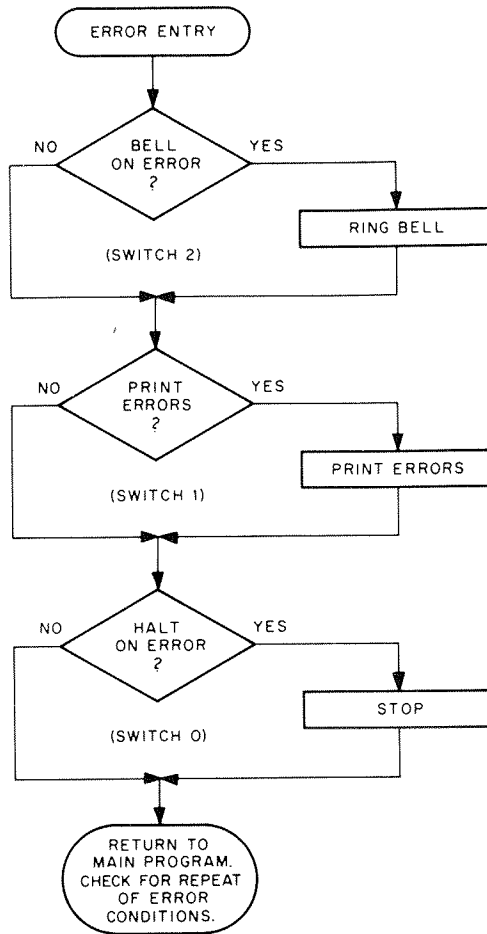
6.2 Error Recovery

6.2.1 Program Diagnosed Error - If AC switch 0 is a 1, the computer will halt on a diagnosed error. To recover from this type of error, reset AC switches 0 to 4 as necessary, (see section 4.1) and then depress CONTINUE.

6.2.2 Interrupt Failures - Interrupt failures will cause a halt at location Y + 1. To recover, reset AC switches 0 to 4 as necessary (see section 4.1) and then start the computer at location 17400 (BEGIN) after depressing I/O RESET.

6.2.3 Test for ION, JMS Y, and Y - To test particular memory locations for the ION, JMS Y, and/or Y, store the address of the ION in location 17756 (POINT1), that address + 1 in location 17757 (POINT2), the address Y in location 17760 (POINT3). Then set AC switches 3 and 4 to 1, depress I/O RESET, and start the computer at location 17400 (BEGIN). Y and location of ION must be less than 17377 and not 00000 or 00001.

6.3 Error Switch Hierarchy



6.4 Error Typeout Example

```

    ION - JMS Y
    JMS AT      " Y "      C(0)      C ( Y )
    0 0 1 2 3 4  0 0 7 6 5 4  0 0 1 2 3 5  7 4 0 0 4 0
  
```

The above example shows that a JMS 7654 instruction was stored in location 1234 (it is implied that the ION is in 1233). The 1235 stored in location 00000 as well as the 740040 (HLT) in Y indicates the JMS was not completed before the computer went into program interrupt.

7. MISCELLANEOUS

7.1 Execution Time

Approximately 96 μsec per ION/JMS Y instruction group.

8. PROGRAM DESCRIPTION

- a. The first function that is performed is that of initialization. A register to count loops and a location to assure typeout of the error message header are initialized, and the bell on the Teletype is rung to raise the teleprinter flag to assure a flag for program interrupt.
- b. Then a check is made to see if the locations of the ION and JMS Y instructions should be changed (switch 4). If they are not changed, the program proceeds to c. If they are, a number is obtained from a random number generator, made into an address and checked that it is below the program, not equal to Y or Y + 1, not equal to 00000 or 00001, and stored in POINT 1 and incremented and stored in POINT 2.
- c. Then a check is made to see if the number Y should be changed (switch 3). If it is not, the program proceeds to d. If it is, a number is obtained from a different random number generator than was used in b, made into an address, checked to see that it was at least 2 below the program, not equal to the location of ION or JMS Y instructions, not equal to 00000 or 00001, and stored in POINT 3.
- d. Then HALT is stored in all memory locations in the test area of memory. The ION instruction is stored, as well as the JMS Y instruction after it has been formed from Y and JMS. The AC and Link are then cleared and control is transferred to the ION/JMS Y instruction group.
- e. Upon return from the program interrupt, the contents of location Y are checked as well as the contents of location 00000 to make sure the proper numbers were stored in these locations. If not, the error subroutine is called.
- f. A check is then made to see if the SCOPE mode (AC switches 3 and 4 a 1) has been requested and if so, control is immediately transferred back to the instruction group.
- g. If the instruction group is not being SCOPED, a check is made on ringing the bell (switch 2) after which control goes back to b.

```

                .TITLE IONJMS
            /
            /JMS Y-INTERRUPT TEST
            /
                .FULL
17400          .LOC 17400
            /
17400          777700      BEGIN      LAW 17700
17401          057743      DAC COUNT      /SET UP TO COUNT LOOPS
17402          760207      LAW 207
17403          117601      JMS TYPE        /RING BELL TO SET UP I/O FLAG
17404          777714      LAW MESS1
17405          057541      DAC ERROR1+13    /INITIALIZE ERROR TYPEOUT ROUTINE
            /
17406          750004      HERE1      LAS
17407          517751      AND MASK2
17410          740200      SZ          /VARY CURRENT LOCATION?
17411          617442      JMP HERE2      /NO
17412          117631      JMS RANDOM    /YES, GENERATE RANDOM ADDRESS
17413          517747      AND MASK
17414          057757      DAC POINT1     /STORE IN "ION" POINTER
17415          057760      DAC POINT2     /STORE IN "JMS Y" POINTER
17416          457760      ISZ POINT2     /AND INCREMENT
17417          741200      SNA           /IS "ION"=0?
17420          617412      JMP HERE1+4    /YES
17421          557754      SAD ONE        /HOW ABOUT 1?
17422          617412      JMP HERE1+4    /YES
17423          357767      TAD UPLIM      /IS THE "ION" POINTER
17424          740100      SMA           /INSIDE THIS PROGRAM?
17425          617412      JMP HERE1+4    /YES, GENERATE ANOTHER
17426          217760      LAC POINT2     /NO, NOW HOW ABOUT
17427          357767      TAD UPLIM      /THE "JMS Y" POINTER
17430          740100      SMA           /IS IT OK?
17431          617412      JMP HERE1+4    /NO, TRY AGAIN
17432          217761      LAC POINT3     /OK SO FAR, NOW IS "Y" POINTER
17433          557757      SAD POINT1     /EQUAL TO "ION" POINTER?
17434          617412      JMP HERE1+4    /YES
17435          557760      SAD POINT2     /NO, EQUAL TO "JMS Y" POINTER?
17436          617412      JMP HERE1+4    /YES
17437          357754      TAD ONE        /ADD 1 AND CHECK
17440          557757      SAD POINT1     /THAT THERE IS AT LEAST
17441          617412      JMP HERE1+4    /ONE LOCATION BETWEEN "Y" + "ION"
    
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17442	750004	HERE2	LAS	
17443	517750		AND MASK1	
17444	740200		SZA	/VARY "Y" POINTER
17445	617470		JMP HERE3	/NO
17446	117642		JMS RANDOM	/YES, GENERATE RANDOM ADDRESS
17447	517747		AND MASK	
17450	057761		DAC POINT3	/AND STORE IN POINT 3
17451	741200		SNA	/IS "Y"=0?
17452	617446		JMP HERE2+4	/YES
17453	557754		SAD ONE	/HOW ABOUT 1?
17454	617446		JMP HERE2+4	/YES
17455	357771		TAD UPLIM2	/IS "Y" INSIDE PROGRAM OR
17456	740100		SMA	/FIRST LOCATION BEFORE
17457	617446		JMP HERE2+4	/YES
17460	217761		LAC POINT3	/OK SO FAR NOW IS "Y" POINTER
17461	557757		SAD POINT1	/EQUAL TO "ION" POINTER
17462	617446		JMP HERE2+4	/YES
17463	557760		SAD POINT2	/NO, EQUAL TO "JMS Y" POINTER
17464	617446		JMP HERE2+4	/YES
17465	357754		TAD ONE	/ADD 1 AND CHECK
17466	557757		SAD POINT1	/THAT THERE IS AT LEAST
17467	617446		JMP HERE2+4	/ONE LOCATION BETWEEN "Y" + "ION"
		/		
17470	117615	HERE3	JMS HALT	/STORE HALTS IN MEMORY
17471	217745		LAC IONCON	/THEN THE ION VIA
17472	077757		DAC* POINT1	/"ION" POINTER
17473	217761		LAC POINT3	/GET "Y"
17474	257746		XOR JMCON	/FORM JMS "Y"
17475	077760		DAC* POINT2	/STORE VIA "JMS Y" POINTER
17476	754000		CLA:CLL	/CLEAR AC & L
17477	637757		JMP* POINT1	/EXECUTE ION-JMS Y

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17500      217760      RETURN      LAC POINT2      /GET LOCATION OF JMS
17501      357754      TAD ONE      /FORM ADDRESS STORED IN "Y"
17502      577761      SAD* POINT3  /IS THIS NUMBER STORED IN Y?
17503      741000      SKP          /YES, ALL OK
17504      617511      JMP .+5      .
17505      217761      LAC POINT3   /NO, ERROR
17506      357754      TAD ONE
17507      540000      SAD 0        /C(0)=C(POINT3)+1?
17510      741000      SKP          /YES
17511      117526      JMS ERROR1   /NO
17512      750004      LAS
17513      742010      RTL
17514      742010      RTL
17515      740400      SNL          /MOVE BITS 3 + 4 INTO LINK 1 AC
17516      617521      JMP .+3      /LOOP ON CURRENT "Y"?
17517      755100      SPA!CLA!CLL /NO
17520      637757      JMP* POINT1  /YES, LOOP ON CURRENT LOCATION?
                                     /YES, RETURN TO ION-JMS Y

17521      750004      LAS
17522      742010      RTL
17523      740100      SMA          /RING BELL?
17524      117571      JMS BELL     /YES
17525      617406      JMP HERE1
    
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/ERROR TYPEOUT SUBROUTINE

/

17526	000000	ERROR1	0	
17527	750004		LAS	
17530	742010		RTL	
17531	740100		SMA	/RING BELL?
17532	617535		JMP .+3	/NO
17533	760207		LAW 207	
17534	117601		JMS TYPE	
17535	750004		LAS	
17536	740010		RAL	
17537	741100		SPA	/PRINT ERRORS?
17540	617564		JMP .+24	/NO
17541	777714		LAW MESS1	
17542	117673		JMS MPRINT	/PRINT HEADER
17543	217753		LAC NEWINS	
17544	057541		DAC ERROR1+13	/CHANGE SO THAT HEADER PRINTS ONLY ONCE
17545	217760		LAC POINT2	
17546	117653		JMS PRINT	/TYPE LOCATION OF JMS
17547	760240		LAW 240	
17550	117601		JMS TYPE	/1 SPACE
17551	217761		LAC POINT3	
17552	117653		JMS PRINT	/TYPE "Y"
17553	760240		LAW 240	
17554	117601		JMS TYPE	/1 SPACE
17555	200000		LAC 0	
17556	117653		JMS PRINT	/PRINT C(0)
17557	760240		LAW 240	
17560	117601		JMS TYPE	/1 SPACE
17561	237761		LAC* POINT3	
17562	760207		LAW 207	
17563	117653		JMS PRINT	/C(Y)
17564	117607		JMS CRLF	/CR-LF
17565	750004		LAS	
17566	741100		SPA	/HALT ON ERROR?
17567	740040		XX	/YES
17570	637526		JMP* ERROR1	/EXIT

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/USEFUL SUBROUTINES
/
17571      000000      BELL      0
17572      457743      ISZ COUNT
17573      637571      JMP* BELL
17574      417400      XCT BEGIN
17575      057743      DAC COUNT
17576      760207      LAW 207
17577      117601      JMS TYPE
17600      637571      JMP* BELL

/
17601      000000      TYPE      0 ,
17602      517762      AND RUBOUT
17603      700406      TLS
17604      700401      TSF
17605      617604      JMP .-1
17606      637601      JMP* TYPE

/
17607      000000      CRLF     0
17610      760215      LAW 215
17611      117601      JMS TYPE
17612      760212      LAW 212
17613      117601      JMS TYPE
17614      637607      JMP* CRLF

/
/
/SUBROUTINE TO STORE HALTS IN MEMORY
/
17615      000000      HALT     0
17616      157755      DZM PNTR
17617      217744      LAC HLTCON
17620      077755      DAC* PNTR
17621      457755      ISZ PNTR
17622      217755      LAC PNTR
17623      557770      SAD UPLIM1
17624      741000      SKP
17625      617617      JMP HALT+2
17626      217742      LAC CON1
17627      040001      DAC 1
17630      637615      JMP* HALT
    
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17631      000000
17632      217640
17633      744010
17634      741400
17635      357641
17636      057640
17637      637631
17640      000005
17641      000003

17642      000000
17643      217651
17644      744010
17645      741400
17646      357652
17647      057651
17650      637642
17651      000175
17652      000003

17653      000000
17654      057765
17655      777772
17656      057764
17657      217765
17660      744010
17661      740010
17662      742010
17663      057765
17664      517763
17665      357741
17666      117601
17667      217765
17670      457764
17671      617661
17672      637653

/RANDOM NUMBER GENERATORS
/
RANDOM      0
           LAC RAND1
           RAL!CLL
           SZL
           TAD RAND1+1
           DAC RAND1
           JMP* RANDOM

RAND1      5
           3

/
RANDOM      0
           LAC RAND2
           RAL!CLL
           SZL
           TAD RAND2+1
           DAC RAND2
           JMP* RANDUM

RAND2      175
           3

/
/OCTAL PRINT SUBROUTINE
/
PRINT      0
           DAC TEMP
           LAW 17772
           DAC TALLY
           LAC TEMP
           RAL!CLL
           RAL
           RTL
           DAC TEMP
           AND SEVEN
           TAD ASKII
           JMS TYPE
           LAC TEMP
           ISZ TALLY
           JMP .-10
           JMP* PRINT
    
```

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/MESSAGE PRINT SUBROUTINE

17673	000000	MPRINT	Ø
17674	057756		DAC PNTR1
17675	237756		LAC* PNTR1
17676	742020		RTR
17677	742020		RTR
17700	742020		RTR
17701	742020		RTR
17702	740020		RAR
17703	117601		JMS TYPE
17704	557762		SAD RUBOUT
17705	637673		JMP* MPRINT
17706	237756		LAC* PNTR1
17707	117601		JMS TYPE
17710	557762		SAD RUBOUT
17711	637673		JMP* MPRINT
17712	457756		ISZ PNTR1
17713	617675		JMP MPRINT+2

/

/

/ERROR MESSAGE HEADER

17714	215212	MESS1	215212	/CRLF
17715	311317		311317	/I,Ø
17716	316255		316255	/N,-
17717	312315		312315	/J,M
17720	323240		323240	/S,SP
17721	331215		331215	/Y,CR
17722	212312		212312	/LF,J
17723	315323		315323	/M,S
17724	240301		240301	/SP,A
17725	324240		324240	/T,SP
17726	240240		240240	/SP,SP
17727	242331		242331	/",Y
17730	242240		242240	/",SP
17731	240240		240240	/SP,SP
17732	303250		303250	/C,(
17733	260251		260251	/Ø,)
17734	240240		240240	/SP,SP
17735	240303		240303	/SP,C
17736	250331		250331	/(),Y
17737	251215		251215	/),CR
17740	212377		212377	/LF,RO

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```
17741 000260      /CONSTANTS AND VARIABLES
17742 617500      /
17743 000000      ASKII      260
17744 740040      CON1      JMP RETURN
17745 700042      COUNT     0
17746 100000      HLTCON   HLT
17747 017777      IONCON   ION
17750 040000      JMSSCON  JMS
17751 020000      MASK     17777
17752 010000      MASK1    40000
17753 617545      MASK2    20000
17754 000001      MASK3    10000
17755 000000      NEWINS   JMP ERROR1+17
17756 000000      ONE      1
17757 000002      PNTR     0
17760 000003      PNTR1    0
17761 000004      POINT1   2
17762 000377      POINT2   3
17763 000007      POINT3   4
17764 000000      RUBOUT   377
17765 000000      SEVEN    7
17766 000002      TALLY    0
17767 760400      TEMP     0
17770 017400      TWO      2
17771 760401      UPLIM    -BEGIN
                                UPLIM1    BEGIN
                                UPLIM2    -BEGIN+1
                                /
                                .END
000000
```

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ASKII	17741	
BEGIN	17400	
BELL	17571	
CON1	17742	
COUNT	17743	
CRLF	17607	
ERROR1	17526	
HALT	17615	
HERE1	17406	
HERE2	17442	
HERE3	17470	
HLTCON	17744	
IONCON	17745	
JMCON	17746	
MASK	17747	
MASK1	17750	
MASK2	17751	
MASK3	17752	
MESS1	17714	
MPRINT	17673	
NEWSINS	17753	
ONE	17754	
PNTR	17755	
PNTR1	17756	
POINT1	17757	
POINT2	17760	
POINT3	17761	
PRINT	17653	
RANDOM	17631	
RANDUM	17642	
RAND1	17640	
RAND2	17651	
RETURN	17500	
RUBOUT	17762	
SEVEN	17763	
TALLY	17764	
TEMP	17765	
TWO	17766	
TYPE	17601	
UPLIM	17767	
UPLIM1	17770	
UPLIM2	17771	

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BEGIN	17400
HERE1	17406
HERE2	17442
HERE3	17470
RETURN	17500
ERROR1	17526
BELL	17571
TYPE	17601
URLF	17607
HALT	17615
RANDOM	17631
RAND1	17640
RANDUM	17642
RAND2	17651
PRINT	17653
MPRINT	17673
MESS1	17714
ASKIT	17741
CON1	17742
COUNT	17743
HLTCON	17744
IONCON	17745
JMSCON	17746
MASK	17747
MASK1	17750
MASK2	17751
MASK3	17752
NEWINS	17753
ONE	17754
PNTR	17755
PNTR1	17756
POINT1	17757
POINT2	17760
POINT3	17761
RUBOUT	17762
SEVEN	17763
TALLY	17764
TEMP	17765
TWO	17766
UPLIM	17767
UPLIM1	17770
UPLIM2	17771

