

.REN X

IDENTIFICATION

PRODUCT CODE: MAINDEC-1080-8MTT  
PRODUCT NAME: DECSYSTEM-1080 BASIC MEMORY TIMING TEST  
DATE RELEASED: JUNE 20, 1975  
MAINTAINED BY: DIAGNOSTIC ENGINEERING  
AUTHOR: JAMES KELLY

COPYRIGHT (C) 1975  
DIGITAL EQUIPMENT CORPORATION  
MAYLBORO, MASS. 01752

THIS SOFTWARE IS FURNISHED TO THE PURCHASER UNDER A LICENSE TO USE ON A SINGLE COMPUTER SYSTEM AND CAN BE COPIED (WITH INCLUSION OF DEC'S COPYRIGHT NOTICE) ONLY FOR USE ON SUCH SYSTEM, EXCEPT AS MAY OTHERWISE BE PROVIDED IN WRITING BY DEC.

ACTUAL DISTRIBUTION OF THE SOFTWARE DESCRIBED IN THIS DOCUMENT WILL BE SUBJECT TO TERMS AND CONDITIONS TO BE ANNOUNCED ON SOME FUTURE DATE BY DIGITAL EQUIPMENT CORPORATION.

THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE AND SHOULD NOT BE CONSIDERED AS A COMMITMENT BY DIGITAL EQUIPMENT CORPORATION.

DEC ASSUMES NO RESPONSIBILITY FOR THE USE OR RELIABILITY OF ITS SOFTWARE ON EQUIPMENT WHICH IS NOT SUPPLIED BY DEC.

00000.P11

XX

TABLE OF CONTENTS

1.0	ABSTRACTS
2.0	REQUIREMENTS
2.1	EQUIPMENT
2.2	STORAGE
2.3	PRELIMINARY PROGRAMS
3.0	PROGRAM PROCEDURES
3.1	LOADING PROCEDURES
3.2	STARTING PROCEDURES
4.0	ERRORS
4.1	ERROR PC RANGE
5.0	CYCLE TIME
6.0	PROGRAM DESCRIPTION
7.0	LISTING

## 1.0 ABSTRACT

THE BASIC MEMORY TIMING TEST (BMTT) IS DESIGNED TO VERIFY THAT THE BASIC MEMORY CYCLE TIME OF CORE MEMORY IS WITHIN TOLERANCE. THIS IS ACCOMPLISHED BY COMPARING THE SPEED OF THE KW11-L REAL TIME CLOCK VERSUS THE TIME REQUIRED FOR A SMALL SET OF INSTRUCTIONS TO BE EXECUTED. NO ATTEMPT IS MADE TO COMPUTE ACTUAL MACHINE TIMING. A SHORT VERIFICATION OF THE KW11-L IS DONE PRIOR TO THE TIMING TEST.

## 2.0 REQUIREMENTS

### 2.1 EQUIPMENT

A PDP-11/40 EQUIPPED WITH AT LEAST 40K OF MEMORY.

A DECTAPE DRIVE FOR LOADING THE PROGRAM.

A CONSOLE TELETYPE TO COMMAND THE MONITOR.

A KW11-L REAL TIME CLOCK.

### 2.2 STORAGE

THIS PROGRAM OCCUPIES MEMORY LOCATIONS 1000(8) THRU 1522(8). IN ADDITION THE STACK POINTER IS SET TO 3000, AND THE APPROPRIATE INTERRUPT VECTORS WILL BE SET UP BY THE SOFTWARE PRIOR TO USE.

### 2.3 PRELIMINARY PROGRAMS

ALL BASIC CPU INSTRUCTION SET DIAGNOSTIC'S MUST HAVE BEEN SUCCESSFULLY RUN PRIOR TO ATTEMPTING TO RUN THIS PROGRAM.

### 3.0 PROGRAM PROCEDURES

#### 3.1 LOADING PROCEDURES

1. MOUNT THE DECTAPE CONTAINING THE BMTT DIAGNOSTIC TEST ONTO A WORKING DECTAPE DRIVE.
2. SET THE WRITE LOCK SWITCH TO WRITE LOCK.
3. SET THE DRIVES SELECT TO UNIT #0.
4. SET THE MODE SWITCH TO ONLINE.
5. SET 177072 INTO THE PDP-11/40 SWITCH REGISTER.
6. DEPRESS THE HALT SWITCH ON THE PDP-11/40.
7. DEPRESS THE START KEY ON THE PDP-11/40 SEVERAL TIMES. THIS INITIALIZES THE CPU.
8. SET THE HALT KEY TO THE RUN POSITION (UP).
9. DEPRESS THE START KEY AND RELEASE ONE TIME.
10. THE SELECTED DECTAPE DRIVE WILL BEGIN TO TURN.
11. THE CONSOLE WILL TYPE THE MONITOR'S NAME FOLLOWED BY A "P".
12. TYPE DBK00A.BIN <CR>.

#### 3.2 STARTING PROCEDURES

TO START THE BMTT PROGRAM PROCEED AS FOLLOWS:

1. SET THE PDP-11/40 ADDRESS TO 1000.
2. DEPRESS AND RELEASE THE START KEY.
3. THE PROCESSOR WILL RUN FOR LESS THAN A SECOND AND HALT WITH ADDRESS 1514 DISPLAYED IN THE ADDRESS REGISTER.
4. IF THE PROCESSOR HALTS AT ANY ADDRESS OTHER THAN THE ABOVE, IT IS AN ERROR. REFER TO THE LISTING FOR A DETAILED DESCRIPTION OF THE SYNTAX.

#### 4.0 ERRORS

ANY HALT OTHER THAN WITH 1514 DISPLAYED IS AN ERROR AND WILL HAVE TO BE REPAIRED BEFORE ATTEMPTING ANY FURTHER TESTING. TO TROUBLE SHOOT AN ERROR USING BNIT THE ERROR HALT SHOULD BE REPLACED WITH A "NOP" 240. THE PROGRAM CAN THEN BE RESTARTED AT THE BEGINNING OF THE FOLLOWING SUBTEST.

#### 4.1 ERROR PC RANGE

ADDRESS(ES) 1000 THRU 1516 INCLUSIVE ARE LEGAL ERROR HALTS WITH THE SINGLE EXCEPTION OF ADDRESS 1512 DISPLAYED AS 1514.

#### 5.0 CYCLE TIME

THE SPEED OF EXECUTION IS PRACTICALLY INSTANTLY.

#### 6.0 PROGRAM DESCRIPTION

BNIT CONSISTS OF FIVE BASIC TESTS. THE FIRST FOUR ARE A CURSORY CHECK OF THE KILL-L REAL TIME CLOCK. THE FIFTH BEING THE ACTUAL TIMING TEST. THE FIRST FOUR TESTS DETERMINE THAT THE CLOCK EXISTS, THAT IT WILL SET ITS MONITOR BIT, CAUSE INTERRUPTS AND THAT IT CAN BE LOCKED OUT BY CLEARING THE INTERRUPT ENABLE BIT. THE FINAL TEST WAITS FOR THE CLOCK TO SET ITS MONITOR BIT THUS GIVING US A COMPLETE CYCLE FOR ONE TEST, THEN STARTING A SIMPLE TIME OUT LOOP. WHEN THE KILL-L CAUSES AN INTERRUPT THE NUMBER OF ITERATIONS IN THE TIMEOUT LOOP ARE COMPARED TO A PREVIOUSLY CALCULATED NORMAL RANGE TO DETERMINE THAT THE MACHINE SPEED IS NORMAL.

BASIC MEMORY TIMING TESTS FLOWS

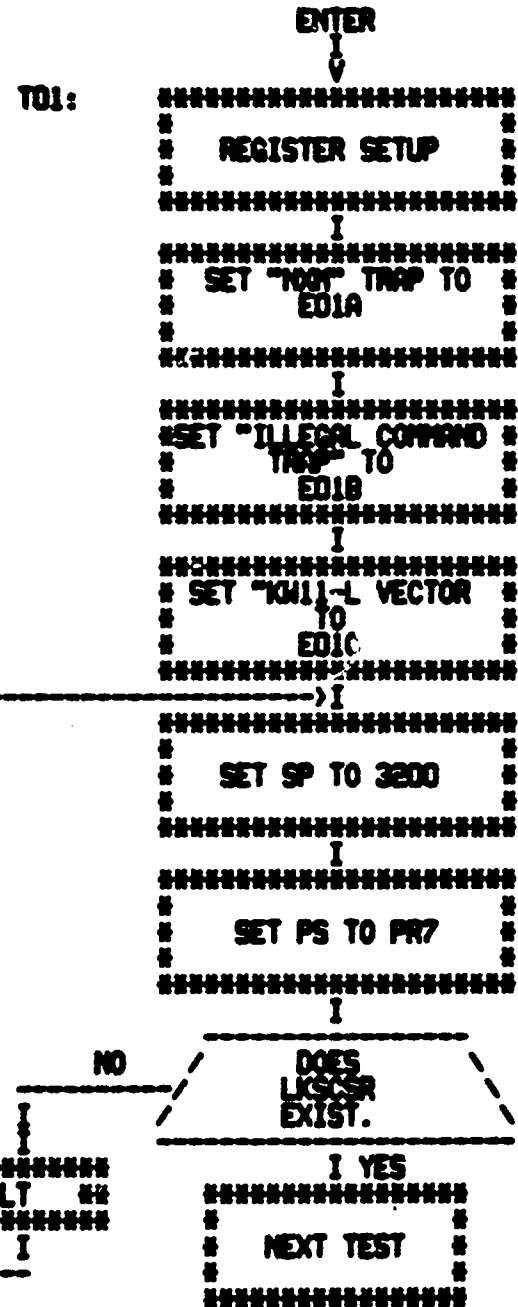
DECFLO VER 00.0



BASIC MEMORY TIMING TESTS FLOWS

DECFO VER 00.0

26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
00



TO1 DETERMINES IF THE KILL-L REAL TIME CSR REGIST CAUSING A TIME OUT.

NOTE

321  
322  
323  
324

THE RESERVED INSTRUCTION AND NON-EXISTANT MEMORY  
SHOWN IN THIS TEST, SHOULD ANY TEST IN THIS DIAGN  
HALT WILL BE ON THIS PAGE IT WILL BE NECESSARY TO  
STACK TO DETERMINE WHERE THE TRAPPED WAS CAUSED.



BASIC MEMORY TIMING TESTS FLOWS

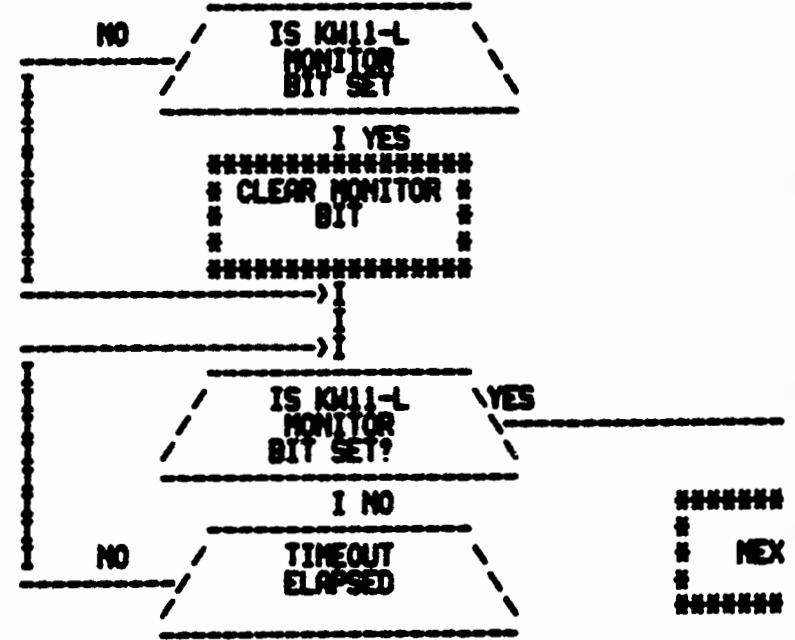
DECFL0 VER 00.0

T02:

```

#####
# REGISTER SETUP #
# #####
# I
#####
#SET KILL-L VECTOR TO #
# ED2A #
# #####
# I
#####
# SET SP TO 3200 #
# #####
# I

```



```

#####
# NEX
#####
#####
ED2: #####
#####
ERROR HALT MONITOR
#####

```

K01

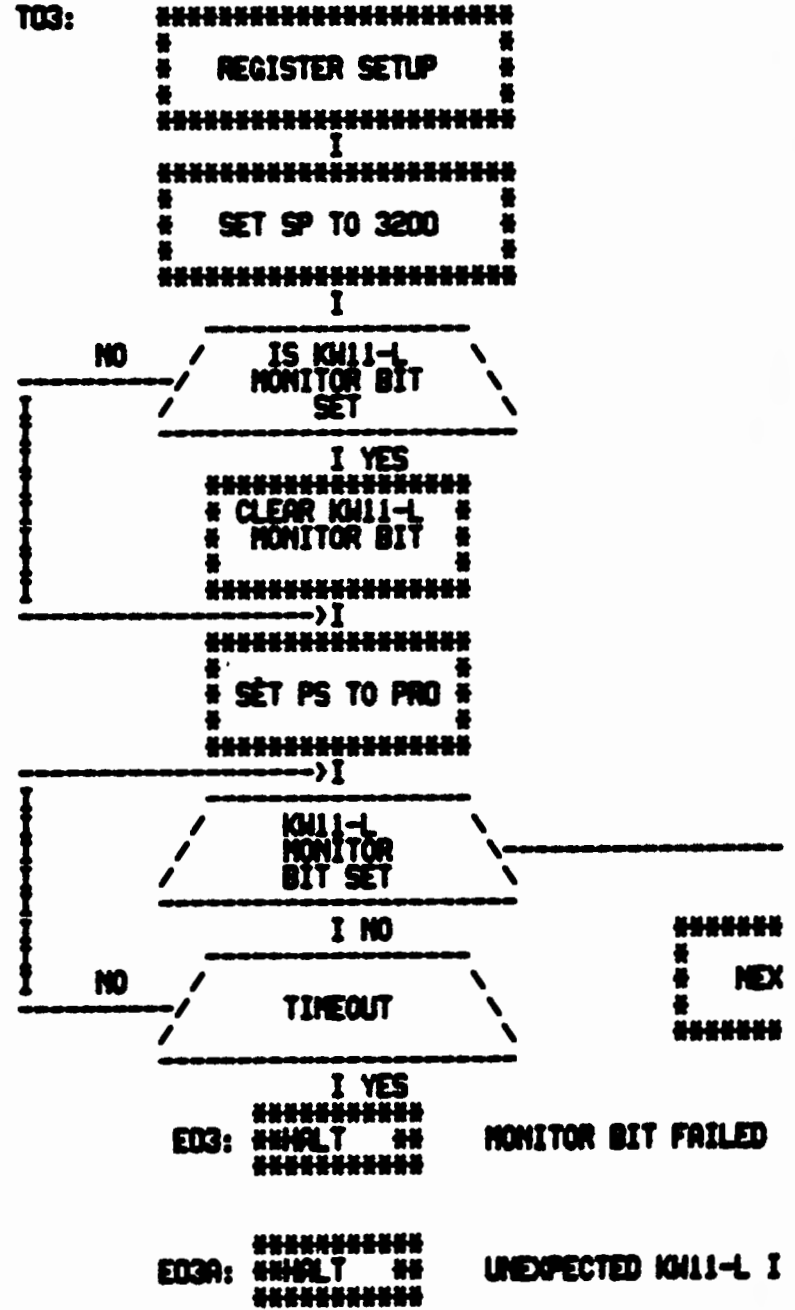
BTTC MACY11 27(722) 14-OCT-76 16:22 PAGE 11  
D0K000.P11

201  
202

EDBA: #HHLT # UNEXPECTED KILL-L I  
#####

BASIC MEMORY TIMING TESTS FLOWS

DECFL0 VER 00.0





NO1.

BHTT NACY11 27(732) 14-OCT-76 16:22 PAGE 14  
DEKORA.P11

495  
496  
497

\* NEXT TEST \*  
\* \*  
\*\*\*\*\*

BASIC MEMORY TIMING TESTS FLOW

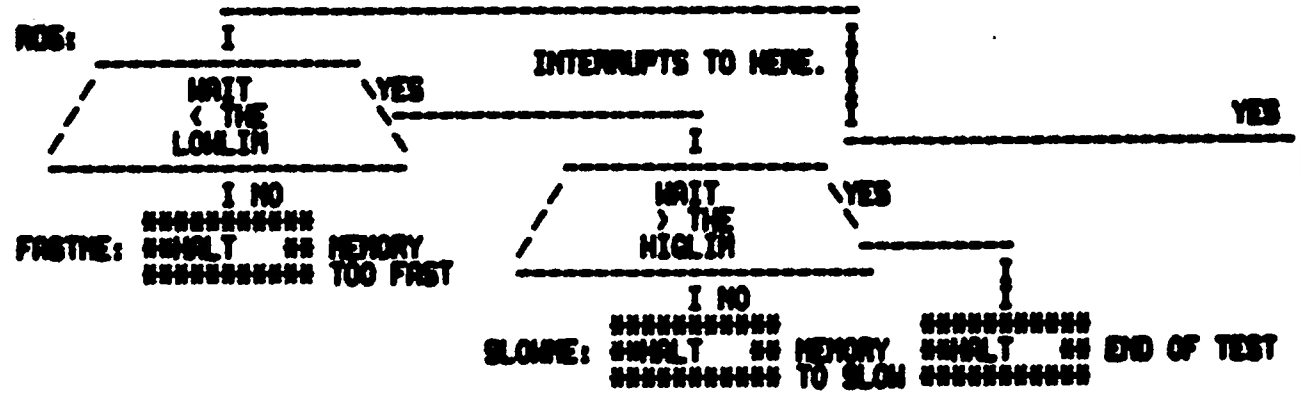
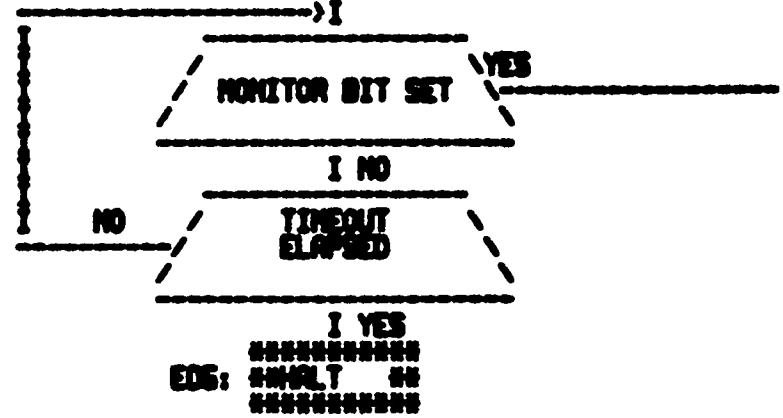
DECPLO VER 00.0

FETCH CYCLE TIME:  
TOS:

```

#####
* REGISTER SETUP *
#####
I
#####
* SET SP TO 3800 *
#####
I
#####
* SET NULL-L VECTOR *
* TO "ROS" *
#####

```



002

BITT MRCY11 27(732) 14-OCT-76 16:22 PAGE 16  
00000.P11

00000

00









;CHECK THE CONTENTS OF THE STACK  
;TO DETERMINE IT'S ORIGIN.

\*\*\*\*\*

TEST #1	(PC)	(PS)	(SP)	TEST	DEV#	ADDRESS	WRS	S/B
	(R7)	(PSH)	(R6)	(RD)	(R1)	(R2)	(R3)	(R4)
1110	340	3174	1	1	1775%	0	0	

\*\*\*\*\*

001106 000000  
001110 000765

ED18: HALT  
BR LD1 ;\*\*\*ILLEGAL COMMAND.  
;LOCK ON FATAL ERROR.  
;SEE COMMENT FOR PREVIOUS ERROR.

\*\*\*\*\*

TEST #1	(PC)	(PS)	(SP)	TEST	DEV#	ADDRESS	WRS	S/B
	(R7)	(PSH)	(R6)	(RD)	(R1)	(R2)	(R3)	(R4)
1114	340	3174	1	1	1775%	0	0	

\*\*\*\*\*

001112 000000  
001114 000763

ED1C: HALT  
BR LD1 ;\*\*\* UNEXPECTED KMI-L INTERRUPT.  
;LOCK ON FATAL ERROR.

SETTL KMI-L MONITOR BIT.  
\*\*\*\*\*

T02 ATTEMPTS TO SEE IF THE LINE CURRENT EVER SETS THE MONITOR BIT. THIS IS ACCOMPLISHED AS FOLLOWS:

- 1). TEST TO SEE IF THE MONITOR BIT IS ALREADY SET, IT PROBABLY WILL BE.
- 2). IF THE MONITOR BIT WAS SET CLEAR IT.
- 3). CLEAR A TIMER REGISTER FOR MAXIMUM WAITING TIME.
- 4). WAIT AROUND IN A TIME LOOP FOR THE FLAG TO SET.
- 5). IF IT FAILS TO SET PRIOR TO TIMEOUT THEN HALT.

\*\*\*\*\*

```

001116 012700 000002
001118 012701 000001
001120 012702 177546
001122 012704 000200

001136 012737 001204 000100
001144 012737 000340 000102

001152 012706 003200
001156 006006

001160 040412
001162 001401

001164 040412

001166 011203
001170 040412
001172 001006

001174 006206
001176 001373

```

```

T02:  MOV  R2,R0          ;R0=TEST NUMBER.
      MOV  R1,R1          ;R1=DEVICE (CLOCK #1).
      MOV  R2,0LKCSR,R2  ;ADDRESS TO R2.
      MOV  R4,0ALMON,R4  ;SHOULD BE.

      MOV  R2,0ED2R,2ALKSVEC ;SET KMI-L INTERRUPT VECTOR.
      MOV  R7,2ALKSVEC+2  ;SET PRIORITY TO #7.

L02:  MOV  R5,3200        ;SET STACK TO 3200.
      CLR  R5             ;CLEAR TIMER.

      BIT  R4,(R2)        ;MONITOR BIT SET?
      BEQ  R0             ;NO!
      BIC  R4,(R2)        ;YES!
                          ;CLEAR MONITOR BIT.

R02:  MOV  R3,(R2),R3     ;CONTENTS OF LKCSR TO R3.
      BIT  R4,(R2)        ;MONITOR BIT SET?
      BNE  T03           ;YES! GOTO "T03"
      BNE  T03           ;NO!

      INC  R5             ;TIMEOUT OVER?
      BNE  R02           ;NO! CHECK MONITOR BIT AGAIN.

```

\*\*\*\*\*

```

TEST  #2
(PC)  (PS)  (SP)  TEST  DEV#  ADDRESS WAS  SHD BE
(R7)  (PS#) (R6)  (R0)  (R1)  (R2)  (R3)  (R4)
1202  340   3200  2     1     177546  ??????  200

```

\*\*\*\*\*

```

001200 000000
001202 000763

```

```

E02:  HALT
      BR   L02           ;*** MONITOR BIT FAILED TO SET.
                          ;LOCK ON FATAL ERROR.

```

717  
718  
719  
720  
721  
722  
723  
724  
725  
726  
727  
728  
729  
730  
731  
732  
733  
734  
735  
736  
737  
738  
739  
740  
741  
742  
743  
744  
745  
746  
747  
748  
749  
750  
751  
752  
753  
754  
755  
756  
757  
758  
759  
760  
761  
762  
763  
764  
765  
766  
767  
768  
769  
770  
771  
772  
773  
774  
775  
776  
777  
778  
779  
780  
781  
782  
783  
784  
785  
786  
787  
788  
789  
790  
791  
792  
793  
794  
795  
796  
797  
798  
799  
800

XX

XX

TEST	02						
(PC)	(PS)	(SP)	TEST	DEV8	ADDRESS	WAS	S/B
(R7)	(PSH)	(R6)	(R0)	(R1)	(R2)	(R3)	(R4)
1206	340	3174	2	1	177546	??????	200

XX

001204 000000  
001206 000761

ED2A: HALT  
BR L02

;;UNEXPECTED KILL - L INTERRUPT.  
;LOCK ON FATAL ERROR.

SECTL K111-L INTERRUPT ENABLE BIT.

T03 VERIFYS THAT THE MONITOR ENABLE BIT BECOMING SET WITH MACHINE PRIORITY AT 0, WILL NOT CAUSE AN INTERRUPT UNLESS INTERRUPT ENABLE IS ALSO SET, AS FOLLOWS:

- 1).TEST TO SEE IF MONITOR BIT IS SET.
- 2). IF THE MONITOR BIT WAS SET THEN CLEAR IT.
- 3).SET CPU PRIORITY TO 80.
- 4).CLEAR THE TIMER FOR MAXIMUM WAITING TIME.
- 5).WAIT FOR THE MONITOR BIT TO SET IF IT DOESNT SET PRIOR TO THE TIMEOUT THEN HALT.

012700 000000  
 012701 000001  
 012702 177546  
 012703 000000  
 012704 000000  
 012705 001274  
 012706 003200  
 012707 000000  
 012708 000000  
 012709 000000  
 012710 000000  
 012711 000000  
 012712 000000  
 012713 000000  
 012714 000000  
 012715 000000  
 012716 000000  
 012717 000000  
 012718 000000  
 012719 000000  
 012720 000000  
 012721 000000  
 012722 000000  
 012723 000000  
 012724 000000  
 012725 000000  
 012726 000000  
 012727 000000  
 012728 000000  
 012729 000000  
 012730 000000  
 012731 000000  
 012732 000000  
 012733 000000  
 012734 000000  
 012735 000000  
 012736 000000  
 012737 000000  
 012738 000000  
 012739 000000  
 012740 000000  
 012741 000000  
 012742 000000  
 012743 000000  
 012744 000000  
 012745 000000  
 012746 000000  
 012747 000000  
 012748 000000  
 012749 000000  
 012750 000000  
 012751 000000  
 012752 000000  
 012753 000000  
 012754 000000  
 012755 000000  
 012756 000000  
 012757 000000  
 012758 000000  
 012759 000000  
 012760 000000  
 012761 000000  
 012762 000000  
 012763 000000  
 012764 000000  
 012765 000000  
 012766 000000  
 012767 000000  
 012768 000000  
 012769 000000  
 012770 000000  
 012771 000000  
 012772 000000  
 012773 000000  
 012774 000000  
 012775 000000  
 012776 000000  
 012777 000000  
 012778 000000  
 012779 000000  
 012780 000000  
 012781 000000  
 012782 000000  
 012783 000000  
 012784 000000  
 012785 000000  
 012786 000000  
 012787 000000  
 012788 000000  
 012789 000000  
 012790 000000  
 012791 000000  
 012792 000000  
 012793 000000  
 012794 000000  
 012795 000000  
 012796 000000  
 012797 000000  
 012798 000000  
 012799 000000  
 012800 000000  
 012801 000000  
 012802 000000  
 012803 000000  
 012804 000000  
 012805 000000  
 012806 000000  
 012807 000000  
 012808 000000  
 012809 000000  
 012810 000000  
 012811 000000  
 012812 000000  
 012813 000000  
 012814 000000  
 012815 000000  
 012816 000000  
 012817 000000  
 012818 000000  
 012819 000000  
 012820 000000  
 012821 000000  
 012822 000000  
 012823 000000  
 012824 000000  
 012825 000000  
 012826 000000  
 012827 000000  
 012828 000000  
 012829 000000  
 012830 000000  
 012831 000000  
 012832 000000  
 012833 000000  
 012834 000000  
 012835 000000  
 012836 000000  
 012837 000000  
 012838 000000  
 012839 000000  
 012840 000000  
 012841 000000  
 012842 000000  
 012843 000000  
 012844 000000  
 012845 000000  
 012846 000000  
 012847 000000  
 012848 000000  
 012849 000000  
 012850 000000  
 012851 000000  
 012852 000000  
 012853 000000  
 012854 000000  
 012855 000000  
 012856 000000  
 012857 000000  
 012858 000000  
 012859 000000  
 012860 000000  
 012861 000000  
 012862 000000  
 012863 000000  
 012864 000000  
 012865 000000  
 012866 000000  
 012867 000000  
 012868 000000  
 012869 000000  
 012870 000000  
 012871 000000  
 012872 000000  
 012873 000000  
 012874 000000  
 012875 000000  
 012876 000000  
 012877 000000  
 012878 000000  
 012879 000000  
 012880 000000  
 012881 000000  
 012882 000000  
 012883 000000  
 012884 000000  
 012885 000000  
 012886 000000  
 012887 000000  
 012888 000000  
 012889 000000  
 012890 000000  
 012891 000000  
 012892 000000  
 012893 000000  
 012894 000000  
 012895 000000  
 012896 000000  
 012897 000000  
 012898 000000  
 012899 000000  
 012900 000000  
 012901 000000  
 012902 000000  
 012903 000000  
 012904 000000  
 012905 000000  
 012906 000000  
 012907 000000  
 012908 000000  
 012909 000000  
 012910 000000  
 012911 000000  
 012912 000000  
 012913 000000  
 012914 000000  
 012915 000000  
 012916 000000  
 012917 000000  
 012918 000000  
 012919 000000  
 012920 000000  
 012921 000000  
 012922 000000  
 012923 000000  
 012924 000000  
 012925 000000  
 012926 000000  
 012927 000000  
 012928 000000  
 012929 000000  
 012930 000000  
 012931 000000  
 012932 000000  
 012933 000000  
 012934 000000  
 012935 000000  
 012936 000000  
 012937 000000  
 012938 000000  
 012939 000000  
 012940 000000  
 012941 000000  
 012942 000000  
 012943 000000  
 012944 000000  
 012945 000000  
 012946 000000  
 012947 000000  
 012948 000000  
 012949 000000  
 012950 000000  
 012951 000000  
 012952 000000  
 012953 000000  
 012954 000000  
 012955 000000  
 012956 000000  
 012957 000000  
 012958 000000  
 012959 000000  
 012960 000000  
 012961 000000  
 012962 000000  
 012963 000000  
 012964 000000  
 012965 000000  
 012966 000000  
 012967 000000  
 012968 000000  
 012969 000000  
 012970 000000  
 012971 000000  
 012972 000000  
 012973 000000  
 012974 000000  
 012975 000000  
 012976 000000  
 012977 000000  
 012978 000000  
 012979 000000  
 012980 000000  
 012981 000000  
 012982 000000  
 012983 000000  
 012984 000000  
 012985 000000  
 012986 000000  
 012987 000000  
 012988 000000  
 012989 000000  
 012990 000000  
 012991 000000  
 012992 000000  
 012993 000000  
 012994 000000  
 012995 000000  
 012996 000000  
 012997 000000  
 012998 000000  
 012999 000000  
 013000 000000

```

001210 012700 000003
001211 012701 000001
001212 012702 177546
001213 012703 000000
001214 012704 000000
001230 012737 001274 000100
001236 012706 003200
001249 030412
001249 001401
001246 040412
001250 005037 177776
001254 005005
001256 011203
001250 030412
001262 001006
001264 005205
001266 001373
  
```

```

T03:  MOV  R0,R0      ;R0=TEST NUMBER.
      MOV  R1,R1      ;DEVICE (CLOCK #1).
      MOV  R2,R2      ;ADDRESS TO R2.
      MOV  R3,R3      ;SHOULD BE.
      MOV  R4,R4      ;SET K111 - L INTERRUPT VECTOR.
      MOV  R5,R5      ;SET THE STACK POINTER TO 3200.

L03:  MOV  R6,R6      ;MONITOR BIT SET?
      BIT  R4,R4      ;NO!
      BCS  R4,R4      ;YES!
      BIC  R4,R4      ;CLEAR MONITOR BIT.

N03:  CLR  R5         ;SET CPU PRIORITY TO PRD.
      CLR  R6         ;CLEAR TIMER.

R03:  MOV  R3,R3      ;CONTENTS OF LKCSR TO R3.
      BIT  R4,R4      ;MONITOR BIT SET?
      BNE  T04        ;YES! GOTO "T04"
      BNE  T04        ;NO!
      INC  R5         ;TIMEOUT OVER?
      BNE  R03        ;NO! CHECK MONITOR BIT AGAIN.
  
```

```

*****
TEST  R3
(PC)  (PS)  (SP)  TEST  DEV#  ADDRESS WAS  SHD BE
(R7)  (PSH) (R6)  (R0)  (R1)  (R2)  (R3)  (R4)
1272  0     3200  3     1     177546  ??????  200
*****
E03:  HALT ;### MONITOR BIT FAILED TO SET.
  
```

016 001272 000761

BR L03

;LOCK ON FATAL ERROR.

017  
018  
019  
020  
021  
022  
023  
024  
025  
026  
027  
028  
029  
030  
031

\*\*\*\*\*

TEST #3

(PC) (PS) (SP) TEST DEV# ADDRESS HAS S/B

(R7) (PSW) (R6) (R0) (R1) (R2) (R3) (R4)

1276 340 3174 1 1 177564 ?????? 200

\*\*\*\*\*

030 001274 000000  
031 001276 000767

ED3A: HOLT  
BR L03

;###UNEXPECTED KILL - L INTERRUPT.  
;LOCK ON FATAL ERROR.





000  
001  
002  
003  
004  
005  
006  
007  
008  
009  
010  
011  
012  
013  
014  
015  
016  
017  
018  
019  
020  
021  
022  
023  
024  
025  
026  
027  
028  
029  
030  
031  
032  
033  
034  
035  
036  
037  
038  
039  
040  
041  
042  
043  
044  
045  
046  
047  
048  
049  
050  
051  
052  
053  
054  
055  
056  
057  
058  
059  
060  
061  
062  
063  
064  
065  
066  
067  
068  
069  
070  
071  
072  
073  
074  
075  
076  
077  
078  
079  
080  
081  
082  
083  
084  
085  
086  
087  
088  
089  
090  
091  
092  
093  
094  
095  
096  
097  
098  
099

\*\*\*\*\*

001364 000000  
001366 000757

ED4: HALT  
BR L04  
NOV @PR7,2@PS

;FATAL ERROR  
;HANG ON FATAL ERROR.  
;SET PRIORITY TO 87.

SBTTL K011-L FETCH CYCLE TIMING.

\*\*\*\*\*

T05 DETERMINES THE PROCESSOR CYCLE TIME. THIS IS ACCOMPLISHED AS FOLLOWS:

- 1). THE K011-L IS MONITORED UNTIL WE GET TO THE NEXT MONITOR BIT SET.
- 2). CLEAR THE MONITOR BIT.
- 3). CLEAR THE TIMER (R5).
- 4). SET CPU PRIORITY TO PR5.
- 5). WAIT FOR THE INTERRUPT WHILE IN THE TIMEOUT LOOP.
- 6). CHECK THAT THE TIME SPENT WAITING FOR THE INTERRUPT WAS WITHIN TOLERANCE.
- 7). THE CODE WILL RUN UNTIL WE HAVE SERVICED 1 INTERRUPT

\*\*\*\*\*

001376 012700 000005  
001402 012701 000001  
001402 012702 177546  
001412 012704 000200  
001416 012706 003200  
001422 005006  
001424 012737 001476 000100  
001432 011203  
001434 030412  
001436 001004  
001440 005205  
001442 001373  
001444 000000  
001446 000763

```

T05:  MOV    R5,R0           ;R0=TEST ADDRESS.
      MOV    R1,R1           ;R1=DEVICE (CLOCK #1).
      MOV    @LKSCSR,R2      ;ADDRESS TO R2.
      MOV    @K011MON,R4    ;SHOULD BE.

L06:  MOV    @STACK,SP      ;RESET STACK POINTER.
      CLR    R5              ;CLEAR TIMER.

      MOV    @R05,@MLKSVEC  ;SET UP INTERRUPT VECTOR

P05:  MOV    (R2),R3         ;CONTENTS OF LKSCSR TO R3.
      BIT    R4,(R2)         ;MONITOR BIT SET?
      BNE    N06             ;YES

      INC    R5              ;WAIT.
      BNE    P05            ;NO!

```

\*\*\*\*\*

(PC)	(PS)	(SP)	TEST	DEV#	ADDRESS WAS	SHD BE	
(R7)	(PSH)	(R6)	(R0)	(R1)	(R2)	(R3)	(R4)
1446	340	3200	5	1	177546	??????	200

\*\*\*\*\*

```

E06:  HALT                    ;MONITOR BIT FAILED TO SET.
      BR     L06              ;LOCK ON FATAL ERROR.

```

001450  
001452  
001454  
001456  
001472  
001474  
001476  
001504  
001510  
001512  
001514  
001516  
001520  
001522

001450 040112  
001452 062712 000100

MOE: BIC R4,(R2)  
 BIS MOLENA,(R2)

;CLEAR MONITOR BIT  
 ;SET INTERRUPT ENABLE BIT.

001454 005005  
001456 012727 000240 177776

IS: CLR R5  
 MOV MFRS,24PS

;CLEAR TIMER  
 ;SET CPU TO PRIORITY 05.

001456 005205  
001470 001276

IS: INC R5  
 BNE IS

;AWAIT AN INTERRUPT.

\*\*\*\*\*

(PC)	(PS)	(SP)	TEST	DEV8	ADDRESS	MAS	SID	DE
(R7)	(PSM)	(R6)	(R0)	(R1)	(R2)	(R3)	(R4)	
1470	240	3200	5	1	177546	??????	200	

\*\*\*\*\*

001472 000000  
001474 000790

EDGE: HALT BR  
 LOS

;### NO KILL-L INTERRUPT.  
 ;LOCK ON FATAL ERROR.

001476 000527 001520  
001502 102404

MOE: CMP R5,24LOWLIN  
 BLO FASTNE

;IS MEMORY TO FAST?  
 ;YES!

001504 000527 001522  
001510 102404  
001512 000000

MOE: CMP R5,24HIGHLIN  
 BHS SLOWNE  
 HALT

;IS MEMORY TO SLOW?  
 ;YES!  
 ;TEST OKAY. NORMAL HALT

001514 000000  
001516 000000  
001520 012000  
001522 012300  
000001

FASTNE: HALT  
 SLOWNE: HALT  
 LOWLIN: 012000  
 HIGHLIN: 012300  
 .END

BNYEC= 000004  
 COLIA 001110  
 COLIB 001111  
 COLIC 001112  
 COLID 001113  
 COLIE 001114  
 COLIF 001115  
 COLIG 001116  
 COLIH 001117  
 COLII 001118  
 COLIJ 001119  
 COLIK 001120  
 COLIL 001121  
 COLIM 001122  
 COLIN 001123  
 COLIO 001124  
 COLIP 001125  
 COLIQ 001126  
 COLIR 001127  
 COLIS 001128  
 COLIT 001129  
 COLIU 001130  
 COLIV 001131  
 COLIW 001132  
 COLIX 001133  
 COLIY 001134  
 COLIZ 001135  
 COLJA 001136  
 COLJB 001137  
 COLJC 001138  
 COLJD 001139  
 COLJE 001140  
 COLJF 001141  
 COLJG 001142  
 COLJH 001143  
 COLJI 001144  
 COLJJ 001145  
 COLJK 001146  
 COLJL 001147  
 COLJM 001148  
 COLJN 001149  
 COLJO 001150  
 COLJP 001151  
 COLJQ 001152  
 COLJR 001153  
 COLJS 001154  
 COLJT 001155  
 COLJU 001156  
 COLJV 001157  
 COLJW 001158  
 COLJX 001159  
 COLJY 001160  
 COLJZ 001161  
 COLKA 001162  
 COLKB 001163  
 COLKC 001164  
 COLKD 001165  
 COLKE 001166  
 COLKF 001167  
 COLKG 001168  
 COLKH 001169  
 COLKI 001170  
 COLKJ 001171  
 COLKK 001172  
 COLKL 001173  
 COLKM 001174  
 COLKN 001175  
 COLKO 001176  
 COLKP 001177  
 COLKQ 001178  
 COLKR 001179  
 COLKS 001180  
 COLKT 001181  
 COLKU 001182  
 COLKV 001183  
 COLKW 001184  
 COLKX 001185  
 COLKY 001186  
 COLKZ 001187  
 COLLA 001188  
 COLLB 001189  
 COLLC 001190  
 COLLD 001191  
 COLLE 001192  
 COLLF 001193  
 COLLG 001194  
 COLLH 001195  
 COLLI 001196  
 COLLJ 001197  
 COLLK 001198  
 COLLL 001199  
 COLLM 001200  
 COLLN 001201  
 COLLO 001202  
 COLLP 001203  
 COLLQ 001204  
 COLLR 001205  
 COLLS 001206  
 COLLT 001207  
 COLLU 001208  
 COLLV 001209  
 COLLW 001210  
 COLLX 001211  
 COLLY 001212  
 COLLZ 001213  
 COLMA 001214  
 COLMB 001215  
 COLMC 001216  
 COLMD 001217  
 COLME 001218  
 COLMF 001219  
 COLMG 001220  
 COLMH 001221  
 COLMI 001222  
 COLMJ 001223  
 COLMK 001224  
 COLML 001225  
 COLMN 001226  
 COLMO 001227  
 COLMP 001228  
 COLMQ 001229  
 COLMR 001230  
 COLMS 001231  
 COLMT 001232  
 COLMU 001233  
 COLMV 001234  
 COLMW 001235  
 COLMX 001236  
 COLMY 001237  
 COLMZ 001238  
 COLNA 001239  
 COLNB 001240  
 COLNC 001241  
 COLND 001242  
 COLNE 001243  
 COLNF 001244  
 COLNG 001245  
 COLNH 001246  
 COLNI 001247  
 COLNJ 001248  
 COLNK 001249  
 COLNL 001250  
 COLNO 001251  
 COLNP 001252  
 COLNQ 001253  
 COLNR 001254  
 COLNS 001255  
 COLNT 001256  
 COLNU 001257  
 COLNV 001258  
 COLNW 001259  
 COLNX 001260  
 COLNY 001261  
 COLNZ 001262  
 COLOA 001263  
 COLOB 001264  
 COLOC 001265  
 COLOD 001266  
 COLOE 001267  
 COLOF 001268  
 COLOG 001269  
 COLOH 001270  
 COLOI 001271  
 COLOJ 001272  
 COLOK 001273  
 COLOL 001274  
 COLOM 001275  
 COLON 001276  
 COLOO 001277  
 COLOP 001278  
 COLOQ 001279  
 COLOR 001280  
 COLOS 001281  
 COLOT 001282  
 COLOU 001283  
 COLOV 001284  
 COLOW 001285  
 COLOX 001286  
 COLOY 001287  
 COLOZ 001288  
 COLPA 001289  
 COLPB 001290  
 COLPC 001291  
 COLPD 001292  
 COLPE 001293  
 COLPF 001294  
 COLPG 001295  
 COLPH 001296  
 COLPI 001297  
 COLPJ 001298  
 COLPK 001299  
 COLPL 001300  
 COLPN 001301  
 COLPO 001302  
 COLPP 001303  
 COLPQ 001304  
 COLPR 001305  
 COLPS 001306  
 COLPT 001307  
 COLPU 001308  
 COLPV 001309  
 COLPW 001310  
 COLPX 001311  
 COLPY 001312  
 COLPZ 001313  
 COLQA 001314  
 COLQB 001315  
 COLQC 001316  
 COLQD 001317  
 COLQE 001318  
 COLQF 001319  
 COLQG 001320  
 COLQH 001321  
 COLQI 001322  
 COLQJ 001323  
 COLQK 001324  
 COLQL 001325  
 COLQM 001326  
 COLQN 001327  
 COLQO 001328  
 COLQP 001329  
 COLQQ 001330  
 COLQR 001331  
 COLQS 001332  
 COLQT 001333  
 COLQU 001334  
 COLQV 001335  
 COLQW 001336  
 COLQX 001337  
 COLQY 001338  
 COLQZ 001339  
 COLRA 001340  
 COLRB 001341  
 COLRC 001342  
 COLRD 001343  
 COLRE 001344  
 COLRF 001345  
 COLRG 001346  
 COLRH 001347  
 COLRI 001348  
 COLRJ 001349  
 COLRK 001350  
 COLRL 001351  
 COLRO 001352  
 COLRP 001353  
 COLRQ 001354  
 COLRR 001355  
 COLRS 001356  
 COLRT 001357  
 COLRU 001358  
 COLRV 001359  
 COLRW 001360  
 COLRX 001361  
 COLRY 001362  
 COLRZ 001363  
 COLSA 001364  
 COLSB 001365  
 COLSC 001366  
 COLSD 001367  
 COLSE 001368  
 COLSF 001369  
 COLSG 001370  
 COLSH 001371  
 COLSI 001372  
 COLSJ 001373  
 COLSK 001374  
 COLSL 001375  
 COLSO 001376  
 COLSP 001377  
 COLSQ 001378  
 COLSR 001379  
 COLSS 001380  
 COLST 001381  
 COLSU 001382  
 COLSV 001383  
 COLSW 001384  
 COLSX 001385  
 COLSY 001386  
 COLSZ 001387  
 COLTA 001388  
 COLTB 001389  
 COLTC 001390  
 COLTD 001391  
 COLTE 001392  
 COLTF 001393  
 COLTG 001394  
 COLTH 001395  
 COLTI 001396  
 COLTJ 001397  
 COLTK 001398  
 COLTL 001399  
 COLTO 001400  
 COLTP 001401  
 COLTQ 001402  
 COLTR 001403  
 COLTS 001404  
 COLTT 001405  
 COLTU 001406  
 COLTV 001407  
 COLTW 001408  
 COLTX 001409  
 COLTY 001410  
 COLTZ 001411  
 COLUA 001412  
 COLUB 001413  
 COLUC 001414  
 COLUD 001415  
 COLUE 001416  
 COLUF 001417  
 COLUG 001418  
 COLUH 001419  
 COLUI 001420  
 COLUJ 001421  
 COLUK 001422  
 COLUL 001423  
 COLUM 001424  
 COLUN 001425  
 COLUO 001426  
 COLUP 001427  
 COLUQ 001428  
 COLUR 001429  
 COLUS 001430  
 COLUT 001431  
 COLUU 001432  
 COLUV 001433  
 COLUW 001434  
 COLUX 001435  
 COLUY 001436  
 COLUZ 001437  
 COLVA 001438  
 COLVB 001439  
 COLVC 001440  
 COLVD 001441  
 COLVE 001442  
 COLVF 001443  
 COLVG 001444  
 COLVH 001445  
 COLVI 001446  
 COLVJ 001447  
 COLVK 001448  
 COLVL 001449  
 COLVO 001450  
 COLVP 001451  
 COLVQ 001452  
 COLVR 001453  
 COLVS 001454  
 COLVT 001455  
 COLVU 001456  
 COLVV 001457  
 COLVW 001458  
 COLVX 001459  
 COLVY 001460  
 COLVZ 001461  
 COLWA 001462  
 COLWB 001463  
 COLWC 001464  
 COLWD 001465  
 COLWE 001466  
 COLWF 001467  
 COLWG 001468  
 COLWH 001469  
 COLWI 001470  
 COLWJ 001471  
 COLWK 001472  
 COLWL 001473  
 COLWO 001474  
 COLWP 001475  
 COLWQ 001476  
 COLWR 001477  
 COLWS 001478  
 COLWT 001479  
 COLWU 001480  
 COLWV 001481  
 COLWW 001482  
 COLWX 001483  
 COLWY 001484  
 COLWZ 001485  
 COLXA 001486  
 COLXB 001487  
 COLXC 001488  
 COLXD 001489  
 COLXE 001490  
 COLXF 001491  
 COLXG 001492  
 COLXH 001493  
 COLXI 001494  
 COLXJ 001495  
 COLXK 001496  
 COLXL 001497  
 COLXO 001498  
 COLXP 001499  
 COLXQ 001500  
 COLXR 001501  
 COLXS 001502  
 COLXT 001503  
 COLXU 001504  
 COLXV 001505  
 COLXW 001506  
 COLXX 001507  
 COLXY 001508  
 COLXZ 001509  
 COLYA 001510  
 COLYB 001511  
 COLYC 001512  
 COLYD 001513  
 COLYE 001514  
 COLYF 001515  
 COLYG 001516  
 COLYH 001517  
 COLYI 001518  
 COLYJ 001519  
 COLYK 001520  
 COLYL 001521  
 COLYO 001522  
 COLYP 001523  
 COLYQ 001524  
 COLYR 001525  
 COLYS 001526  
 COLYT 001527  
 COLYU 001528  
 COLYV 001529  
 COLYW 001530  
 COLYX 001531  
 COLYY 001532  
 COLYZ 001533  
 COLZA 001534  
 COLZB 001535  
 COLZC 001536  
 COLZD 001537  
 COLZE 001538  
 COLZF 001539  
 COLZG 001540  
 COLZH 001541  
 COLZI 001542  
 COLZJ 001543  
 COLZK 001544  
 COLZL 001545  
 COLZO 001546  
 COLZP 001547  
 COLZQ 001548  
 COLZR 001549  
 COLZS 001550  
 COLZT 001551  
 COLZU 001552  
 COLZV 001553  
 COLZW 001554  
 COLZX 001555  
 COLZY 001556  
 COLZZ 001557  
 COLAA 001558  
 COLAB 001559  
 COLAC 001560  
 COLAD 001561  
 COLAE 001562  
 COLAF 001563  
 COLAG 001564  
 COLAH 001565  
 COLAI 001566  
 COLAJ 001567  
 COLAK 001568  
 COLAL 001569  
 COLAM 001570  
 COLAN 001571  
 COLAO 001572  
 COLAP 001573  
 COLAQ 001574  
 COLAR 001575  
 COLAS 001576  
 COLAT 001577  
 COLAU 001578  
 COLAV 001579  
 COLAW 001580  
 COLAX 001581  
 COLAY 001582  
 COLAZ 001583  
 COLBA 001584  
 COLBB 001585  
 COLBC 001586  
 COLBD 001587  
 COLBE 001588  
 COLBF 001589  
 COLBG 001590  
 COLBH 001591  
 COLBI 001592  
 COLBJ 001593  
 COLBK 001594  
 COLBL 001595  
 COLBO 001596  
 COLBP 001597  
 COLBQ 001598  
 COLBR 001599  
 COLBS 001600  
 COLBT 001601  
 COLBU 001602  
 COLBV 001603  
 COLBW 001604  
 COLBX 001605  
 COLBY 001606  
 COLBZ 001607  
 COLCA 001608  
 COLCB 001609  
 COLCC 001610  
 COLCD 001611  
 COLCE 001612  
 COLCF 001613  
 COLCG 001614  
 COLCH 001615  
 COLCI 001616  
 COLCJ 001617  
 COLCK 001618  
 COLCL 001619  
 COLCO 001620  
 COLCP 001621  
 COLCQ 001622  
 COLCR 001623  
 COLCS 001624  
 COLCT 001625  
 COLCU 001626  
 COLCV 001627  
 COLCW 001628  
 COLCX 001629  
 COLCY 001630  
 COLCZ 001631  
 COLDA 001632  
 COLDB 001633  
 COLDC 001634  
 COLDD 001635  
 COLDE 001636  
 COLDF 001637  
 COLDG 001638  
 COLDH 001639  
 COLDI 001640  
 COLDJ 001641  
 COLDK 001642  
 COLDL 001643  
 COLDO 001644  
 COLDP 001645  
 COLDQ 001646  
 COLDR 001647  
 COLDS 001648  
 COLDT 001649  
 COLDU 001650  
 COLDV 001651  
 COLDW 001652  
 COLDX 001653  
 COLDY 001654  
 COLDZ 001655  
 COLEA 001656  
 COLEB 001657  
 COLEC 001658  
 COLED 001659  
 COL EE 001660  
 COL EF 001661  
 COL EG 001662  
 COL EH 001663  
 COL EI 001664  
 COL EJ 001665  
 COL EK 001666  
 COL EL 001667  
 COL EO 001668  
 COL EP 001669  
 COL EQ 001670  
 COL ER 001671  
 COL ES 001672  
 COL ET 001673  
 COL EU 001674  
 COL EV 001675  
 COL EW 001676  
 COL EX 001677  
 COL EY 001678  
 COL EZ 001679  
 COLFA 001680  
 COLFB 001681  
 COLFC 001682  
 COLFD 001683  
 COLFE 001684  
 COLFF 001685  
 COLFG 001686  
 COLFH 001687  
 COLFI 001688  
 COLFJ 001689  
 COLFK 001690  
 COLFL 001691  
 COLFO 001692  
 COLFP 001693  
 COLFQ 001694  
 COLFR 001695  
 COLFS 001696  
 COLFT 001697  
 COLFU 001698  
 COLFV 001699  
 COLFW 001700  
 COLFX 001701  
 COLFY 001702  
 COLFZ 001703  
 COLGA 001704  
 COLGB 001705  
 COLGC 001706  
 COLGD 001707  
 COLGE 001708  
 COLGF 001709  
 COLGG 001710  
 COLGH 001711  
 COLGI 001712  
 COLGJ 001713  
 COLGK 001714  
 COLGL 001715  
 COLGO 001716  
 COLGP 001717  
 COLGQ 001718  
 COLGR 001719  
 COLGS 001720  
 COLGT 001721  
 COLGU 001722  
 COLGV 001723  
 COLGW 001724  
 COLGX 001725  
 COLGY 001726  
 COLGZ 001727  
 COLHA 001728  
 COLHB 001729  
 COLHC 001730  
 COLHD 001731  
 COLHE 001732  
 COLHF 001733  
 COLHG 001734  
 COLHH 001735  
 COLHI 001736  
 COLHJ 001737  
 COLHK 001738  
 COLHL 001739  
 COLHO 001740  
 COLHP 001741  
 COLHQ 001742  
 COLHR 001743  
 COLHS 001744  
 COLHT 001745  
 COLHU 001746  
 COLHV 001747  
 COLHW 001748  
 COLHX 001749  
 COLHY 001750  
 COLHZ 001751  
 COLIA 001752  
 COLIB 001753  
 COLIC 001754  
 COLID 001755  
 COLIE 001756  
 COLIF 001757  
 COLIG 001758  
 COLIH 001759  
 COLII 001760  
 COLIJ 001761  
 COLIK 001762  
 COLIL 001763  
 COLIM 001764  
 COLIN 001765  
 COLIO 001766  
 COLIP 001767  
 COLIQ 001768  
 COLIR 001769  
 COLIS 001770  
 COLIT 001771  
 COLIU 001772  
 COLIV 001773  
 COLIW 001774  
 COLIX 001775  
 COLIY 001776  
 COLIZ 001777  
 COLJA 001778  
 COLJB 001779  
 COLJC 001780  
 COLJD 001781  
 COLJE 001782  
 COLJF 001783  
 COLJG 001784  
 COLJH 001785  
 COLJI 001786  
 COLJJ 001787  
 COLJK 001788  
 COLJL 001789  
 COLJM 001790  
 COLJN 001791  
 COLJO 001792  
 COLJP 001793  
 COLJQ 001794  
 COLJR 001795  
 COLJS 001796  
 COLJT 001797  
 COLJU 001798  
 COLJV 001799  
 COLJW 001800  
 COLJX 001801  
 COLJY 001802  
 COLJZ 001803  
 COLKA 001804  
 COLKB 001805  
 COLKC 001806  
 COLKD 001807  
 COLKE 001808  
 COLKF 001809  
 COLKG 001810  
 COLKH 001811  
 COLKI 001812  
 COLKJ 001813  
 COLKK 001814  
 COLKL 001815  
 COLKM 001816  
 COLKN 001817  
 COLKO 001818  
 COLKP 001819  
 COLKQ 001820  
 COLKR 001821  
 COLKS 001822  
 COLKT 001823  
 COLKU 001824  
 COLKV 001825  
 COLKW 001826  
 COLKX 001827  
 COLKY 001828  
 COLKZ 001829  
 COLLA 001830  
 COLLB 001831  
 COLLC 001832  
 COLLD 001833  
 COLLE 001834  
 COLLF 001835  
 COLLG 001836  
 COLLH 001837  
 COLLI 001838  
 COLLJ 001839  
 COLLK 001840  
 COLLL 001841  
 COLLM 001842  
 COLLN 001843  
 COLLO 001844  
 COLLP 001845  
 COLLQ 001846  
 COLLR 001847  
 COLLS 001848  
 COLLT 001849  
 COLLU 001850  
 COLLV 001851  
 COLLW 001852  
 COLLX 001853  
 COLLY 001854  
 COLLZ 001855  
 COLMA 001856  
 COLMB 001857  
 COLMC 001858  
 COLMD 001859  
 COLME 001860  
 COLMF 001861  
 COLMG 001862  
 COLMH 001863  
 COLMI 001864  
 COLMJ 001865  
 COLMK 001866  
 COLML 001867  
 COLMN 001868  
 COLMO 001869  
 COLMP 001870  
 COLMQ 001871  
 COLMR 001872  
 COLMS 001873  
 COLMT 001874  
 COLMU 001875  
 COLMV 001876  
 COLMW 001877  
 COLMX 001878  
 COLMY 001879  
 COLMZ 001880  
 COLNA 001881  
 COLNB 001882  
 COLNC 001883  
 COLND 001884  
 COLNE 001885  
 COLNF 001886  
 COLNG 001887  
 COLNH 001888  
 COLNI 001889  
 COLNJ 001890  
 COLNK 001891  
 COLNL 001892  
 COLNO 001893  
 COLNP 001894  
 COLNQ 001895  
 COLNR 001896  
 COLNS 001897  
 COLNT 001898  
 COLNU 001899  
 COLNV 001900  
 COLNW 001901  
 COLNX 001902  
 COLNY 001903  
 COLNZ 001904  
 COLOA 001905  
 COLOB 001906  
 COLOC 001907  
 COLOD 001908  
 COLOE 001909  
 COLOF 001910  
 COLOG 001911  
 COLOH 001912  
 COLOI 001913  
 COLOJ 001914  
 COLOK 001915  
 COLOL 001916  
 COLOM 001917  
 COLON 001918  
 COLOO 001919  
 COLOP 001920  
 COLOQ 001921  
 COLOR 001922  
 COLOS 001923  
 COLOT 001924  
 COLOU 001925  
 COLOV 001926  
 COLOW 001927  
 COLOX 001928  
 COLOY 001929  
 COLOZ 001930  
 COLPA 001931  
 COLPB 001932  
 COLPC 001933  
 COLPD 001934  
 COLPE 001935  
 COLPF 001936  
 COLPG 001937  
 COLPH 001938  
 COLPI 001939  
 COLPJ 001940  
 COLPK 001941  
 COLPL 001942  
 COLPN 001943  
 COLPO 001944  
 COLPP 001945  
 COLPQ 001946  
 COLPR 001947  
 COLPS 001948  
 COLPT 001949  
 COLPU 001950  
 COLPV 001951  
 COLPW 001952  
 COLPX 001953  
 COLPY 001954  
 COLPZ 001955  
 COLQA 001956  
 COLQB 001957  
 COLQC 001958  
 COLQD 001959  
 COLQE 001960  
 COLQF 001961  
 COLQG 001962  
 COLQH 001963  
 COLQI 001964  
 COLQJ 001965  
 COLQK 001966  
 COLQL 001967  
 COLQM 001968  
 COLQN 001969  
 COLQO 001970  
 COLQP 001971  
 COLQQ 001972  
 COLQR 001973  
 COLQS 001974  
 COLQT 001975  
 COLQU 001976  
 COLQV 001977  
 COLQW 001978  
 COLQX 001979  
 COLQY 001980  
 COLQZ 001981  
 COLRA 001982  
 COLRB 001983  
 COLRC 001984  
 COLRD 001985  
 COLRE 001986  
 COLRF 001987  
 COLRG 001988  
 COLRH 001989  
 COLRI 001990  
 COLRJ 001991  
 COLRK 001992  
 COLRL 001993  
 COLRO 001994  
 COLRP 001995  
 COLRQ 001996  
 COLRR 001997  
 COLRS 001998  
 COLRT 001999  
 COLRU 002000  
 COLRV 002001  
 COLRW 002002  
 COLRX 002003  
 COLRY 002004  
 COLRZ 002005  
 COLSA 002006  
 COLSB 002007  
 COLSC 002008  
 COLSD 002009  
 COLSE 002010  
 COLSF 002011  
 COLSG 002012  
 COLSH 002013  
 COLSI 002014  
 COLSJ 002015  
 COLSK 002016  
 COLSL 002017  
 COLSO 002018  
 COLSP 002019  
 COLSQ 002020  
 COLSR 002021  
 COLSS 002022  
 COLST 002023  
 COLSU 002024  
 COLSV 002025  
 COLSW 002026  
 COLSX 002027  
 COLSY 002028  
 COLSZ 002029  
 COLTA 002030  
 COLTB 002031  
 COLTC 002032  
 COLTD 002033  
 COLTE 002034  
 COLTF 002035  
 COLTG 002036  
 COLTH 002037  
 COLTI 002038

T08	001116	637	7068
T09	001210	724	7808
T04	001300	738	8568
T06	001276	828	
.	001574	828	



718	789	866																		
720	791	868	932																	
721	792	869	933																	
722	793	870	934	865	873	931														
723	794	871	935	874	877	932	935	939												
724	795	872	936	875	878	933	936	940	950	974										
725	796	873	937	876	879	934	937	941	951	975										
726	797	874	938	877	880	935	938	942	952	976										
727	798	875	939	878	881	936	939	943	953	977										
728	799	876	940	879	882	937	940	944	954	978										
729	800	877	941	880	883	938	941	945	955	979										
730	801	878	942	881	884	939	942	946	956	980										
731	802	879	943	882	885	940	943	947	957	981										
732	803	880	944	883	886	941	944	948	958	982										
733	804	881	945	884	887	942	945	949	959	983										
734	805	882	946	885	888	943	946	950	960	984										
735	806	883	947	886	889	944	947	951	961	985										
736	807	884	948	887	890	945	948	952	962	986										
737	808	885	949	888	891	946	949	953	963	987										
738	809	886	950	889	892	947	950	954	964	988										
739	810	887	951	890	893	948	951	955	965	989										
740	811	888	952	891	894	949	952	956	966	990										
741	812	889	953	892	895	950	953	957	967	991										
742	813	890	954	893	896	951	954	958	968	992										
743	814	891	955	894	897	952	955	959	969	993										
744	815	892	956	895	898	953	956	960	970	994										
745	816	893	957	896	899	954	957	961	971	995										
746	817	894	958	897	900	955	958	962	972	996										
747	818	895	959	898	901	956	959	963	973	997										
748	819	896	960	899	902	957	960	964	974	998										
749	820	897	961	900	903	958	961	965	975	999										
750	821	898	962	901	904	959	962	966	976											
751	822	899	963	902	905	960	963	967	977											
752	823	900	964	903	906	961	964	968	978											
753	824	901	965	904	907	962	965	969	979											
754	825	902	966	905	908	963	966	970	980											
755	826	903	967	906	909	964	967	971	981											
756	827	904	968	907	910	965	968	972	982											
757	828	905	969	908	911	966	969	973	983											
758	829	906	970	909	912	967	970	974	984											
759	830	907	971	910	913	968	971	975	985											
760	831	908	972	911	914	969	972	976	986											
761	832	909	973	912	915	970	973	977	987											
762	833	910	974	913	916	971	974	978	988											
763	834	911	975	914	917	972	975	979	989											
764	835	912	976	915	918	973	976	980	990											
765	836	913	977	916	919	974	977	981	991											
766	837	914	978	917	920	975	978	982	992											
767	838	915	979	918	921	976	979	983	993											
768	839	916	980	919	922	977	980	984	994											
769	840	917	981	920	923	978	981	985	995											
770	841	918	982	921	924	979	982	986	996											
771	842	919	983	922	925	980	983	987	997											
772	843	920	984	923	926	981	984	988	998											
773	844	921	985	924	927	982	985	989	999											
774	845	922	986	925	928	983	986	990												
775	846	923	987	926	929	984	987	991												
776	847	924	988	927	930	985	988	992												
777	848	925	989	928	931	986	989	993												
778	849	926	990	929	932	987	990	994												
779	850	927	991	930	933	988	991	995												
780	851	928	992	931	934	989	992	996												
781	852	929	993	932	935	990	993	997												
782	853	930	994	933	936	991	994	998												
783	854	931	995	934	937	992	995	999												
784	855	932	996	935	938	993	996													
785	856	933	997	936	939	994	997													
786	857	934	998	937	940	995	998													
787	858	935	999	938	941	996	999													
788	859	936		939	942	997														
789	860	937		940	943	998														
790	861	938		941	944	999														
791	862	939		942	945															
792	863	940		943	946															
793	864	941		944	947															
794	865	942		945	948															
795	866	943		946	949															
796	867	944		947	950															
797	868	945		948	951															
798	869	946		949	952															
799	870	947		950	953															
800	871	948		951	954															
801	872	949		952	955															