

APPENDIX A

ASSEMBLY CODE FOR THE SYSTEM (SELF-TEST CODE PLUS APPLICATION PROGRAM)

```
asmcode3.asm      Assembled with CASM  01/30/1999  20:41  PAGE 1
1 ; This program contains the self-test of whole chip i.e. ROM, RAM and
2 ; microcontroller plus the actual
3 ; temperature sensor portion. The fault diagnostic is upto chip level
4 ; watch dog timer included
5 ; External RAM included
6
7 ; MEMORY MAP
8 ; 0000 --      00FF      Internal RAM
9 ; 2000 --      20FF      External RAM(USED IN VHDL MODEL)
10 ; 4000 --      4003      PPI
11 ; 6000 --      7FFF      External EEPROM
12
13
14
0000      15  INITRAM      EQU      $0000
0000      16  PORTA      EQU      $4000
0000      17  PORTB      EQU      $4001
0000      18  PORTC      EQU      $4002
0000      19  COMMAND    EQU      $4003
0000      20  INITROM    EQU      $6000
0000      21  CHKLOC     EQU      $7FFF      ;ADDRESS WHERE THE
                                           ;CHECKSUM WOULD BE PLACED
0000      22  TEMP      EQU      $0010
0000      23  TEMP2     EQU      $0012
0000      24  COPRST    EQU      $103A
0000      25  OPTION    EQU      $1039
0000      26  INITERAM  EQU      $2000
27
28 ;              ORG      $E000
29 ;              JMP      BEGIN
30
6000      31              ORG      $6000      ;START ADDRESS
32
33 ;***** MAIN PROGRAM *****
34
35
6000 8E01FF 36  BEGIN      LDS      #$01FF      ;STACK POINTER
37
38
39              ;LDAA    #$FF
40              ;STAA    $1009      ;DDRD TO OUTPUT
41              ;STAA    $1007      ;DDRC TO OUTPUT
42
6003 8690   43              LDAA    #$90
6005 B74003 44              STAA    COMMAND  ;CONFIG 8255
45              ;PORT A : IN
46              ;PORT B : OUT
47              ;PORT C : OUT
48
49
50
51
52
53              ;TEST VALUES
54              ;LDD     #$FFFF
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```

55             ;LDX     #$FFFF
56             ;LDY     #$FFFF
57
58
6008 BD7AD2    59             JSR     DISPINIT
600B BD7B37    60             JSR     DISPCHECK           ;CHECK WHETHER
                                                ;DISPLAY IS WORKING
61
62
600E BD6063    63             JSR     INITMICRO1       ;THIS ROUTINE IS
                                                ;USED TO TEST THE
64             ;INSTRUCTIONS THAT ARE TO BE USED
65             ;FOR EEPROM, RAM TESTING AND COP
66             ;RESET
6011 BD7B68    66             JSR     SETCOPRST
67
68
6014 8655      69             LDAA    #$55           ;ARM COP RESET
                                                ;MECHANISM
6016 B7103A    70             STAA    COPRST
6019 BD62EC    71             JSR     ROMTEST        ;TEST EEPROM
601C 86AA      72             LDAA    #$AA           ;CLEAR COP RESET
                                                ;MECHANISM
601E B7103A    73             STAA    COPRST
74
75
6021 8655      76             LDAA    #$55           ;ARM COP RESET
                                                ;MECHANISM
6023 B7103A    77             STAA    COPRST
6026 BD63B4    78             JSR     RAMSTART1      ;TEST RAM LOCATIONS 00-EF
79             ;SP=FF INITIALLY
6029 86AA      80             LDAA    #$AA           ;CLEAR COP RESET
                                                ;MECHANISM
602B B7103A    81             STAA    COPRST
82
83
602E 8E000F    84             LDS     #$0F           ;RELOCATE SP
85
86
6031 8655      86             LDAA    #$55
6033 B7103A    87             STAA    COPRST
6036 BD6431    88             JSR     RAMSTART2      ;TEST RAM
                                                ;LOCATIONS F0-1FF
6039 86AA      89             LDAA    #$AA
603B B7103A    90             STAA    COPRST
91
603E 8E01FF    92             LDS     #$01FF        ;RESTORE SP
93             ;CANNOT INCLUDE COP FEATURE HERE
94
95
6041 867E      96             LDAA    #$7E           ;CONTENTS OF VECTOR ADDRESS OF COP
6043 97FA      97             STAA    $00FA         ;RESET HAVE TO BE REWRITTEN SINCE
6045 CE7B7E    98             LDX     #CPRotine     ;THEY WERE DELETED DURIMG RAM TEST

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6048 DFFB      99          STX      $00FB
              100
604A 8655      101          LDAA     #$55          ;ARM COP RESET MECHANISM
604C B7103A    102          STAA     COPRST
604F BD6477    103          JSR      MPTEST       ;TEST MICROCONTROLLER
6052 86AA      104          LDAA     #$AA          ;CLEAR COP RESET MECHANISM
6054 B7103A    105          STAA     COPRST
              106
6057 BD77DE    107          JSR      WAIT1
605A BD77DE    108          JSR      WAIT1
605D BD77DE    109          JSR      WAIT1
              110
6060 BD7803    111          JSR      NORMOPER
              112
              113
              114
              115          ;*****INITMICRO1 TEST *****;
              116          ; Test all the instructions that are going to ;
              117          ; be used in EEPROM, RAM testing and COP reset ;
              118          ; code ;
              119          ;*****;
              120
              121          ;
              122          ;          TEST LOAD, STORE AND COMPARE INSTRUCTIONS
              123          ;          INSTRUCTIONS, AND THE REGISTERS
              124          ;          FOR REGISTER A
6063 86FF      125          INITMICRO1  LDAA     #$FF
6065 9710      126          STAA     TEMP
6067 9610      127          LDAA     TEMP
6069 81FF      128          CMPA     #$FF
606B 2621      129          BNE     MPFLT1
              130

606D 8600      131          LDAA     #$00
606F 9710      132          STAA     TEMP
6071 9610      133          LDAA     TEMP
6073 8100      134          CMPA     #$00
6075 2617      135          BNE     MPFLT1
              136
6077 86AA      137          LDAA     #$AA
6079 9710      138          STAA     TEMP
607B 9610      139          LDAA     TEMP
607D 81AA      140          CMPA     #$AA
607F 260D      141          BNE     MPFLT1
              142
6081 8655      143          LDAA     #$55
6083 9710      144          STAA     TEMP
6085 9610      145          LDAA     TEMP
6087 8155      146          CMPA     #$55
6089 2603      147          BNE     MPFLT1
608B 7E6091    148          JMP      LC20A
              149
608E 7E7915    150          MPFLT1   JMP      MPFLT

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151
152
153 ;          FOR REGISTER B
6091 C6FF    154 LC20A    LDAB    #$FF
6093 D710    155          STAB    TEMP
6095 D610    156          LDAB    TEMP
6097 C1FF    157          CMPB   #$FF
6099 2621    158          BNE    MPFLT2
159
609B C600    160          LDAB    #$00
609D D710    161          STAB    TEMP
609F D610    162          LDAB    TEMP
60A1 C100    163          CMPB   #$00
60A3 2617    164          BNE    MPFLT2
165
60A5 C6AA    166          LDAB    #$AA
60A7 D710    167          STAB    TEMP
60A9 D610    168          LDAB    TEMP
60AB C1AA    169          CMPB   #$AA
60AD 260D    170          BNE    MPFLT2
171
60AF C655    172          LDAB    #$55
60B1 D710    173          STAB    TEMP
60B3 D610    174          LDAB    TEMP
60B5 C155    175          CMPB   #$55
60B7 2603    176          BNE    MPFLT2
60B9 7E60BF  177          JMP    LC20B
178
60BC 7E7915  179 MPFLT2    JMP    MPFLT
180
181 ;          FOR REGISTER D
60BF CC0000  182 LC20B    LDD    #$0000
60C2 DD10    183          STD    TEMP
60C4 DC10    184          LDD    TEMP
60C6 1A830000 185          CPD    #$00
60CA 262A    186          BNE    MPFLT3
187
60CC CC00FF  188          LDD    #$FF
60CF DD10    189          STD    TEMP
60D1 DC10    190          LDD    TEMP
60D3 1A8300FF 191          CPD    #$FF
60D7 261D    192          BNE    MPFLT3
193
60D9 CC0055  194          LDD    #$55
60DC DD10    195          STD    TEMP
60DE DC10    196          LDD    TEMP
60E0 1A830055 197          CPD    #$55
60E4 2610    198          BNE    MPFLT3
199
60E6 CC00AA  200          LDD    #$AA
60E9 DD10    201          STD    TEMP
60EB DC10    202          LDD    TEMP
60ED 1A8300AA 203          CPD    #$AA
60F1 2603    204          BNE    MPFLT3
60F3 7E60F9  205          JMP    LC20C
206
60F6 7E7915  207 MPFLT3    JMP    MPFLT
208

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209 ;          FOR REGISTER X
60F9 CE0000 210 LC20C  LDX    #$0000
60FC DF10   211        STX    TEMP
60FE DE10   212        LDX    TEMP
6100 8C0000 213        CPX    #$00
6103 2627   214        BNE    MPFLT4
215
6105 CE00FF 216        LDX    #$FF
6108 DF10   217        STX    TEMP
610A DE10   218        LDX    TEMP
610C 8C00FF 219        CPX    #$FF
610F 261B   220        BNE    MPFLT4
221
6111 CE0055 222        LDX    #$55
6114 DF10   223        STX    TEMP
6116 DE10   224        LDX    TEMP
6118 8C0055 225        CPX    #$55
611B 260F   226        BNE    MPFLT4
227
611D CE00AA 228        LDX    #$AA
6120 DF10   229        STX    TEMP
6122 DE10   230        LDX    TEMP
6124 8C00AA 231        CPX    #$AA
6127 2603   232        BNE    MPFLT4
6129 7E612F 233        JMP    LC20DA
234
612C 7E7915 235 MPFLT4  JMP    MPFLT
236
237
238 ;          TEST CARRY SET AND CLEAR INSTRUCTIONS
239
612F 0D     240 LC20DA  SEC                    ;TEST SEC
6130 2503   241        BCS    LC24B
6132 7E612C 242        JMP    MPFLT4
6135 0C     243 LC24B   CLC                    ;TEST CLC
6136 25F4   244        BCS    MPFLT4
245
246
247 ;          TEST TAP/TPA
6138 863E   248 LC20D  LDAA    #$3E            ;MAKE CARRY BIT = 0;
613A 06     249        TAP
613B 256E   250        BCS    MPFLT300
613D 07     251        TPA
613E 813E   252        CMPA   #$3E
6140 2669   253        BNE    MPFLT300
254
6142 863F   255        LDAA   #$3F
6144 06     256        TAP
6145 0C     257        CLC
6146 2563   258        BCS    MPFLT300
259
260 ;          TEST ADCB
6148 0C     261 L21M   CLC
6149 CCFFFF 262        LDD    #$FFFF
614C 9710   263        STAA   TEMP
614E D910   264        ADCB   TEMP
6150 C1FE   265        CMPB   #$FE

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6152 2657      266          BNE      MPFLT300
                267
6154 0D        268          SEC
6155 CFFFFFF   269          LDD      #$FFFF
6158 9710      270          STAA    TEMP
615A D910      271          ADCB   TEMP
615C C1FF      272          CMPB   #$FF
615E 264B      273          BNE      MPFLT300
                274
                275
6160 0C        276          CLC
6161 CC0000    277          LDD      #$0000
6164 9710      278          STAA    TEMP
6166 D910      279          ADCB   TEMP
6168 C100      280          CMPB   #$00
616A 263F      281          BNE      MPFLT300
                282
616C 0D        283          SEC
616D CC0000    284          LDD      #$0000
6170 9710      285          STAA    TEMP
6172 D910      286          ADCB   TEMP
6174 C101      287          CMPB   #$01
6176 2633      288          BNE      MPFLT300
                289
6178 0C        290          CLC
6179 CCAA55    291          LDD      #$AA55
617C 9710      292          STAA    TEMP
617E D910      293          ADCB   TEMP
6180 C1FF      294          CMPB   #$FF
6182 2627      295          BNE      MPFLT300
                296
6184 0D        297          SEC
6185 CCAA55    298          LDD      #$AA55
6188 9710      299          STAA    TEMP
618A D910      300          ADCB   TEMP
618C C100      301          CMPB   #$00
618E 261B      302          BNE      MPFLT300
                303
6190 0C        304          CLC
6191 CC55AA    305          LDD      #$55AA
6194 9710      306          STAA    TEMP
6196 D910      307          ADCB   TEMP
6198 C1FF      308          CMPB   #$FF
619A 260F      309          BNE      MPFLT300
                310
619C 0D        311          SEC
619D CC55AA    312          LDD      #$55AA
61A0 9710      313          STAA    TEMP
61A2 D910      314          ADCB   TEMP
61A4 C100      315          CMPB   #$00
61A6 2603      316          BNE      MPFLT300
61A8 7E61AE    317          JMP      LC20H
                318
                319
61AB 7E7915    320 MPFLT300 JMP      MPFLT
                321
                322 ;          TEST   INX

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323
61AE CE003F 324 LC20H LDX    #$003F
61B1 08      325          INX
61B2 8C0040 326          CPX    #$0040
61B5 265D    327          BNE    MPFLT10
61B7 CE007F 328          LDX    #$007F
61BA 08      329          INX
61BB 8C0080 330          CPX    #$0080
61BE 2654    331          BNE    MPFLT10
61C0 CE00FF 332          LDX    #$00FF
61C3 08      333          INX
61C4 8C0100 334          CPX    #$0100
61C7 264B    335          BNE    MPFLT10
61C9 CE01FF 336          LDX    #$01FF
61CC 08      337          INX
61CD 8C0200 338          CPX    #$0200
61D0 2642    339          BNE    MPFLT10
61D2 CE03FF 340          LDX    #$03FF
61D5 08      341          INX
61D6 8C0400 342          CPX    #$0400
61D9 2639    343          BNE    MPFLT10
61DB CE07FF 344          LDX    #$07FF
61DE 08      345          INX
61DF 8C0800 346          CPX    #$0800
61E2 2630    347          BNE    MPFLT10
61E4 CE0FFF 348          LDX    #$0FFF
61E7 08      349          INX
61E8 8C1000 350          CPX    #$1000
61EB 2627    351          BNE    MPFLT10
61ED CE1FFF 352          LDX    #$1FFF
61F0 08      353          INX
61F1 8C2000 354          CPX    #$2000
61F4 261E    355          BNE    MPFLT10
61F6 CE3FFF 356          LDX    #$3FFF
61F9 08      357          INX
61FA 8C4000 358          CPX    #$4000
61FD 2615    359          BNE    MPFLT10
61FF CE7FFF 360          LDX    #$7FFF
6202 08      361          INX
6203 8C8000 362          CPX    #$8000
6206 260C    363          BNE    MPFLT10
6208 CEFFFF 364          LDX    #$FFFF
620B 08      365          INX
620C 8C0000 366          CPX    #$0000
620F 2603    367          BNE    MPFLT10
6211 7E6217 368          JMP    L20F
369
6214 7E7915 370 MPFLT10 JMP    MPFLT
371
372 ;          TEST DEX
373
6217 CE0000 374 L20F LDX    #$0000
621A 09      375          DEX
621B 8CFFFF 376          CPX    #$FFFF
377
621E 2630    378          BNE    MPFLT15
6220 CE8000 379          LDX    #$8000
6223 09      380          DEX

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6224	8C7FFF	381		CPX	#\$7FFF
6227	2627	382		BNE	MPFLT15
6229	CE4000	383		LDX	#\$4000
622C	09	384		DEX	
622D	8C3FFF	385		CPX	#\$3FFF
6230	261E	386		BNE	MPFLT15
6232	CE2000	387		LDX	#\$2000
6235	09	388		DEX	
6236	8C1FFF	389		CPX	#\$1FFF
6239	2615	390		BNE	MPFLT15
		391			
623B	CE1000	392		LDX	#\$1000
623E	09	393		DEX	
623F	8C0FFF	394		CPX	#\$0FFF
6242	260C	395		BNE	MPFLT15
6244	CE0800	396		LDX	#\$0800
6247	09	397		DEX	
6248	8C07FF	398		CPX	#\$07FF
624B	2603	399		BNE	MPFLT15
624D	7E6253	400		JMP	LC20J
		401			
6250	7E7915	402	MPFLT15	JMP	MPFLT
		403			
		404			
6253	CE0400	405	LC20J	LDX	#\$0400
6256	09	406		DEX	
6257	8C03FF	407		CPX	#\$03FF
625A	26F4	408		BNE	MPFLT15
625C	CE0200	409		LDX	#\$0200
625F	09	410		DEX	
6260	8C01FF	411		CPX	#\$01FF
6263	26EB	412		BNE	MPFLT15
6265	CE0100	413		LDX	#\$0100
6268	09	414		DEX	
6269	8C00FF	415		CPX	#\$00FF
626C	26E2	416		BNE	MPFLT15
626E	CE0080	417		LDX	#\$0080
6271	09	418		DEX	
6272	8C007F	419		CPX	#\$007F
6275	26D9	420		BNE	MPFLT15
6277	CE0040	421		LDX	#\$0040
627A	09	422		DEX	
627B	8C003F	423		CPX	#\$003F
627E	26D0	424		BNE	MPFLT15
6280	CE0020	425		LDX	#\$0020
6283	09	426		DEX	
6284	8C001F	427		CPX	#\$001F
6287	26C7	428		BNE	MPFLT15
6289	CE0010	429		LDX	#\$0010
628C	09	430		DEX	
628D	8C000F	431		CPX	#\$000F
6290	26BE	432		BNE	MPFLT15
6292	CE0008	433		LDX	#\$0008
6295	09	434		DEX	
6296	8C0007	435		CPX	#\$0007
6299	26B5	436		BNE	MPFLT15
629B	CE0004	437		LDX	#\$0004
629E	09	438		DEX	


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629F 8C0003      439          CPX      #$0003
62A2 26AC        440          BNE      MPFLT15
62A4 CE0002      441          LDX      #$0002
62A7 09          442          DEX
62A8 8C0001      443          CPX      #$0001
62AB 26A3        444          BNE      MPFLT15
62AD CE0001      445          LDX      #$0001
62B0 09          446          DEX
62B1 8C0000      447          CPX      #$0000
62B4 269A        448          BNE      MPFLT15
449
450
451 ;            TESTING OR INSTRUCTION
452
453 ;            TESTING ORAA
454
62B6 CC55AA      455 L21V      LDD      #$55AA
62B9 D710        456          STAB     TEMP
62BB 9A10        457          ORAA     TEMP
62BD 81FF        458          CMPA     #$FF
62BF 2624        459          BNE      MPFLT69
460
461
62C1 CC5555      462          LDD      #$5555
62C4 D710        463          STAB     TEMP
62C6 9A10        464          ORAA     TEMP
62C8 8155        465          CMPA     #$55
62CA 2619        466          BNE      MPFLT69
467
468
62CC CC0055      469          LDD      #$0055
62CF D710        470          STAB     TEMP
62D1 9A10        471          ORAA     TEMP
62D3 8155        472          CMPA     #$55
62D5 260E        473          BNE      MPFLT69
474
475
62D7 CC00AA      476          LDD      #$00AA
62DA D710        477          STAB     TEMP
62DC 9A10        478          ORAA     TEMP
62DE 81AA        479          CMPA     #$AA
62E0 2603        480          BNE      MPFLT69
62E2 7E6DE7      481          JMP      L21W
482
62E5 7E7915      483 MPFLT69    JMP      MPFLT
484
62E8 7E78F5      485          JMP      MPPASS1
62EB 39          486          RTS
487
488
489
490 ;***** ROM TEST *****;
491 ; Confirm the checksum of the ROM by adding ;
492 ; all locations with carry ;
493 ; ;
494 ;*****;

```

```

495
62EC CC0000 496 ROMTEST LDD    #$00
62EF CE6000 497          LDX    #INITROM
62F2 0C      498          CLC
62F3 07      499          TPA
62F4 9710    500          STAA   TEMP
501
62F6 9610    502 LOC10   LDAA   TEMP
62F8 06      503          TAP
62F9 E900    504          ADCB   0,X          ;READ AND ADD ROM
62FB 07      505          TPA
62FC 9710    506          STAA   TEMP
507
62FE 08      508          INX
62FF 8C8000 509          CPX    #8000

6302 26F2    510          BNE    LOC10
511
6304 F74001  512          STAB   PORTB
6307 C1AA    513          CMPB   #$AA          ;COMPARE WITH THE EXPECTED
514          ;CHECKSUM
6309 2604    515          BNE    ROMSFLT
630B BD6321  516          JSR    ROMSPASS
517
630E 39      518          RTS
519
520
630F BD7B0D  521 ROMSFLT JSR    DISPINIT21
6312 BD792F  522          JSR    ERROR
6315 BD7A38  523          JSR    OUTR
6318 BD7A1D  524          JSR    OUTO
631B BD7A0B  525          JSR    OUTM
631E 7E7B9A  526          JMP    STP
527
528
6321 BD7B0D  529 ROMSPASS JSR    DISPINIT21
6324 BD7A38  530          JSR    OUTR
6327 BD7A1D  531          JSR    OUTO
632A BD7A0B  532          JSR    OUTM
632D BD7A92  533          JSR    OUTSP
6330 BD7992  534          JSR    PASS
6333 BD77DE  535          JSR    WAIT1
6336 BD77DE  536          JSR    WAIT1
6339 BD77DE  537          JSR    WAIT1
633C 39      538          RTS
539
540          ;***** EXTERNAL RAM TEST *****;
541          ; Test the external RAM which is used in the ;
542          ; VHDL model of the system ;
543          ; ;
544          ;*****;
545
633D 18CE2000 546 ERAMSTART LDY    #INITERAM
6341 CC0000  547          LDD    #$00
6344 18A700  548 LC2     STAA   0,Y          ;WRITE ALL ZEROS

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6347 1808      549          INY
6349 188C2100 550          CPY      #$2100
634D 26F5      551          BNE      LC2
634F 18CE2000 553          LDY      #INITERAM
6353 18A600    554    LC3      LDAA     0,Y          ;READ ZEROS
6356 8100      555          CMPA     #$00
6358 2641      556          BNE     ERSFAULT
635A C6FF      557          LDAB     #$FF          ;WRITE ALL ONES
635C 18E700    558          STAB     0,Y
635F 1808      559          INY
6361 188C2100 560          CPY      #$2100
6365 26EC      561          BNE     LC3
6367 18CE20FF 563          LDY      #$20FF
636B 18A600    564    LC4      LDAA     0,Y          ;READ ONES
636E 81FF      565          CMPA     #$FF
6370 2629      566          BNE     ERSFAULT
6372 C600      567          LDAB     #$00
6374 18E700    568          STAB     0,Y          ;WRITE ALL ZEROS
6377 1809      569          DEY
6379 188C1FFF 570          CPY      #$1FFF
637D 26EC      571          BNE     LC4
637F 18CE2000 573          LDY      #INITERAM
6383 18A600    574    LC5      LDAA     0,Y          ;READ ZEROS
6386 8100      575          CMPA     #$00
6388 2611      576          BNE     ERSFAULT
638A 1808      577          INY
638C 188C2100 578          CPY      #$2100
6390 26F1      579          BNE     LC5
6392 BD63AD    582          JSR      ERSPASS
6395 8600      583          LDAA     #$00
6397 B74002    584          STAA     PORTC
639A 39        585          RTS
639B BD792F    588          JSR      ERROR
639E BD7976    589          JSR      EXTERNAL
63A1 BD7A38    590          JSR      OUTR
63A4 BD799F    591          JSR      OUTA
63A7 BD7A0B    592          JSR      OUTM
63AA 7E7B9A    593          JMP      STP
63AD BD7976    596    ERSPASS JSR      EXTERNAL
63B0 BD7ABF    597          JSR      RSPASS
63B3 39        598          RTS
601 ;***** RAM TEST 1 *****;
602 ; Test internal RAM locations 00 - EF H ;
603 ; ;
604 ;*****;

```

```

605
63B4 CE0000 606 RAMSTART1 LDX #0000
63B7 8600 607 LDAA #00
63B9 A700 608 LOC2 STAA INITRAM,X
63BB 08 609 INX
63BC 8C00F0 610 CPX #00F0
63BF 26F8 611 BNE LOC2
612
63C1 CE0000 613 LDX #0000
63C4 A600 614 LOC3 LDAA INITRAM,X
63C6 8100 615 CMPA #00
63C8 2635 616 BNE RSFAULT
63CA C6FF 617 LDAB #FF
63CC E700 618 STAB INITRAM,X
63CE 08 619 INX
63CF 8C00F0 620 CPX #00F0
63D2 26F0 621 BNE LOC3
622
63D4 CE00EF 623 LDX #00EF
63D7 A600 624 LOC4 LDAA INITRAM,X
63D9 81FF 625 CMPA #FF
63DB 2622 626 BNE RSFAULT
63DD C600 627 LDAB #00
63DF E700 628 STAB INITRAM,X
63E1 09 629 DEX
63E2 8CFFFF 630 CPX #FFFF
63E5 26F0 631 BNE LOC4
632
63E7 CE0000 633 LDX #0000
63EA A600 634 LOC5 LDAA INITRAM,X
63EC 8100 635 CMPA #00
63EE 260F 636 BNE RSFAULT
63F0 08 637 INX
63F1 8C00F0 638 CPX #00F0
63F4 26F4 639 BNE LOC5
640
63F6 BD6411 641 JSR RSPASS1
63F9 8600 642 LDAA #00
63FB B74002 643 STAA PORTC
63FE 39 644 RTS
645
646
63FF BD7B0D 647 RSFAULT JSR DISPINIT21
6402 BD792F 648 JSR ERROR
6405 BD7A38 649 JSR OUTR
6408 BD799F 650 JSR OUTA
640B BD7A0B 651 JSR OUTM
640E 7E7B9A 652 JMP STP
653
654
6411 BD7ABF 655 RSPASS1 JSR RSPASS
6414 BD7AA4 656 JSR OUTONE
6417 BD77DE 657 JSR WAIT1
641A BD77DE 658 JSR WAIT1
641D BD77DE 659 JSR WAIT1
6420 39 660 RTS
661
6421 BD7ABF 662 RSPASS2 JSR RSPASS

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```

6424 BD7AAD      663          JSR      OUTWO
6427 BD77DE      664          JSR      WAIT1
642A BD77DE      665          JSR      WAIT1
642D BD77DE      666          JSR      WAIT1
6430 39          667          RTS
668
669      ;***** RAM TEST 2 *****;
670      ;   Test internal RAM locations F0 - 1FF H   ;
671      ;                                           ;
672      ;*****;
673
6431 CE00F0      674  RAMSTART2  LDX      #$00F0
6434 8600        675          LDAA     #$00
6436 A700        676  LOC6       STAA     INITRAM,X
6438 08          677          INX
6439 8C0200      678          CPX      #$0200
643C 26F8        679          BNE     LOC6
680
643E CE00F0      681          LDX      #$00F0
6441 A600        682  LOC7       LDAA     INITRAM,X
6443 8100        683          CMPA     #$00
6445 26B8        684          BNE     RSFAULT
6447 C6FF        685          LDAB     #$FF
6449 E700        686          STAB     INITRAM,X
644B 08          687          INX
644C 8C0200      688          CPX      #$0200
644F 26F0        689          BNE     LOC7
690
6451 CE01FF      691          LDX      #$01FF
6454 A600        692  LOC8       LDAA     INITRAM,X
6456 81FF        693          CMPA     #$FF
6458 26A5        694          BNE     RSFAULT
645A C600        695          LDAB     #$00
645C E700        696          STAB     INITRAM,X
645E 09          697          DEX
645F 8C00EF      698          CPX      #$00EF
6462 26F0        699          BNE     LOC8
700
6464 CE00F0      701          LDX      #$00F0
6467 A600        702  LOC9       LDAA     INITRAM,X
6469 8100        703          CMPA     #$00
646B 2692        704          BNE     RSFAULT
646D 08          705          INX
646E 8C0200      706          CPX      #$0200
6471 26F4        707          BNE     LOC9
708
6473 BD6421      709          JSR      RSPASS2
710
6476 39          711          RTS
712
713
714      ;***** MPTEST *****;
715      ; Test all the remaining instructions and   ;
716      ; registers of the microcontroller         ;
717      ;                                           ;

```

```

718 ;*****;
719
720 ; REGISTER Y: TEST LOAD/STORE/COMPARE INSTRUCTIONS
721 ; AND THE REGISTER ITSELF
6477 18CE0000 722 MPTEST LDY #00
647B 18DF10 723 STY TEMP
647E 18DE10 724 LDY TEMP
6481 188C0000 725 CPY #00
6485 2633 726 BNE MPFLT5
727
6487 18CE00FF 728 LDY #FF
648B 18DF10 729 STY TEMP
648E 18DE10 730 LDY TEMP
6491 188C00FF 731 CPY #FF
6495 2623 732 BNE MPFLT5
733
6497 18CE0055 734 LDY #55
649B 18DF10 735 STY TEMP
649E 18DE10 736 LDY TEMP
64A1 188C0055 737 CPY #55
64A5 2613 738 BNE MPFLT5
739
64A7 18CE00AA 740 LDY #AA
64AB 18DF10 741 STY TEMP
64AE 18DE10 742 LDY TEMP
64B1 188C00AA 743 CPY #AA
64B5 2603 744 BNE MPFLT5
64B7 7E64BD 745 JMP LC20E
746
64BA 7E7915 747 MPFLT5 JMP MPFLT
748
749
750 ; STACK POINTER: TEST LOAD/STORE/COMPARE INSTRUCTIONS
751 ; AND THE REGISTER ITSELF
752
64BD 9F12 753 LC20E STS TEMP2
64BF 8E0000 754 LDS #0000
64C2 9F10 755 STS TEMP
64C4 CE0000 756 LDX #0000
64C7 9C10 757 CPX TEMP
64C9 2629 758 BNE MPFLT6
64CB 8E00FF 759 LDS #00FF
64CE 9F10 760 STS TEMP
64D0 CE00FF 761 LDX #00FF
64D3 9C10 762 CPX TEMP
64D5 261D 763 BNE MPFLT6
64D7 8E0055 764 LDS #0055
64DA 9F10 765 STS TEMP
64DC CE0055 766 LDX #0055
64DF 9C10 767 CPX TEMP
64E1 2611 768 BNE MPFLT6
64E3 8E00AA 769 LDS #00AA
64E6 9F10 770 STS TEMP
64E8 CE00AA 771 LDX #00AA

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64EB 9C10      772          CPX      TEMP
64ED 2605      773          BNE      MPFLT6
64EF 9E12      774          LDS      TEMP2
64F1 7E64F7    775          JMP      LC20F
776
64F4 7E7915    777 MPFLT6    JMP      MPFLT
778
779 ;          TEST CBA
780
64F7 CCFFFF    781 LC20F    LDD      #$FFFF
64FA 11        782          CBA
64FB 2615      783          BNE      MPFLT7
64FD CC0000    784          LDD      #$0000
6500 11        785          CBA
6501 260F      786          BNE      MPFLT7
6503 CC55AA    787          LDD      #$55AA
6506 11        788          CBA
6507 2603      789          BNE      LC20F1
6509 7E6512    790          JMP      MPFLT7
650C CCAA55    791 LC20F1    LDD      #$AA55
650F 11        792          CBA
6510 2603      793          BNE      LC20G
794
6512 7E7915    795 MPFLT7    JMP      MPFLT
796
797
798 ;          TEST THE INCREMENT INSTRUCTIONS NEXT
799
800 ;          TEST INCA
801
6515 8600      802 LC20G    LDAA     #$00
6517 4C        803          INCA
6518 8101      804          CMPA     #$01
651A 263B      805          BNE      MPFLT8
651C 8601      806          LDAA     #$01
651E 4C        807          INCA
651F 8102      808          CMPA     #$02
6521 2634      809          BNE      MPFLT8
6523 8603      810          LDAA     #$03
6525 4C        811          INCA
6526 8104      812          CMPA     #$04
6528 262D      813          BNE      MPFLT8
652A 8607      814          LDAA     #$07
652C 4C        815          INCA
652D 8108      816          CMPA     #$08
652F 2626      817          BNE      MPFLT8
6531 860F      818          LDAA     #$0F
6533 4C        819          INCA
6534 8110      820          CMPA     #$10
6536 261F      821          BNE      MPFLT8
6538 861F      822          LDAA     #$1F
653A 4C        823          INCA
653B 8120      824          CMPA     #$20
653D 2618      825          BNE      MPFLT8
653F 863F      826          LDAA     #$3F
6541 4C        827          INCA
6542 8140      828          CMPA     #$40

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```

6544 2611      829          BNE      MPFLT8
6546 867F      830          LDAA    #$7F
6548 4C        831          INCA
6549 8180      832          CMPA    #$80
654B 260A      833          BNE      MPFLT8
654D 86FF      834          LDAA    #$FF
654F 4C        835          INCA
6550 8100      836          CMPA    #$00
6552 2603      837          BNE      MPFLT8
6554 7E655A    838          JMP      L20A
839
6557 7E7915    840 MPFLT8    JMP      MPFLT
841
842 ;          TEST  INCB
843
655A C600      844 L20A      LDAB    #$00
655C 5C        845          INCB
655D C101      846          CMPB    #$01
655F 263B      847          BNE      MPFLT9
6561 C601      848          LDAB    #$01
6563 5C        849          INCB
6564 C102      850          CMPB    #$02
6566 2634      851          BNE      MPFLT9
6568 C603      852          LDAB    #$03
656A 5C        853          INCB
656B C104      854          CMPB    #$04
656D 262D      855          BNE      MPFLT9
656F C607      856          LDAB    #$07
6571 5C        857          INCB
6572 C108      858          CMPB    #$08
6574 2626      859          BNE      MPFLT9
6576 C60F      860          LDAB    #$0F
6578 5C        861          INCB
6579 C110      862          CMPB    #$10
657B 261F      863          BNE      MPFLT9
657D C61F      864          LDAB    #$1F
657F 5C        865          INCB
6580 C120      866          CMPB    #$20
6582 2618      867          BNE      MPFLT9
6584 C63F      868          LDAB    #$3F
6586 5C        869          INCB
6587 C140      870          CMPB    #$40
6589 2611      871          BNE      MPFLT9
658B C67F      872          LDAB    #$7F
658D 5C        873          INCB
658E C180      874          CMPB    #$80
6590 260A      875          BNE      MPFLT9
6592 C6FF      876          LDAB    #$FF
6594 5C        877          INCB
6595 C100      878          CMPB    #$00
6597 2603      879          BNE      MPFLT9
6599 7E659F    880          JMP      L20BB
881
659C 7E7915    882 MPFLT9    JMP      MPFLT
883
884
885
886 ;          TEST  INY

```



```

887
659F 18CE0000 888 L20BB LDY #0000
65A3 1808 889 INY
65A5 188C0001 890 CPY #0001
65A9 2657 891 BNE MPFLT11
65AB 18CE0001 892 LDY #0001
65AF 1808 893 INY
65B1 188C0002 894 CPY #0002
65B5 264B 895 BNE MPFLT11
65B7 18CE0003 896 LDY #0003
65BB 1808 897 INY
65BD 188C0004 898 CPY #0004
65C1 263F 899 BNE MPFLT11
65C3 18CE0007 900 LDY #0007
65C7 1808 901 INY
65C9 188C0008 902 CPY #0008
65CD 2633 903 BNE MPFLT11
65CF 18CE000F 904 LDY #000F
65D3 1808 905 INY
65D5 188C0010 906 CPY #0010
65D9 2627 907 BNE MPFLT11
908
65DB 18CE001F 909 LDY #001F
65DF 1808 910 INY
65E1 188C0020 911 CPY #0020
65E5 261B 912 BNE MPFLT11
65E7 18CE003F 913 LDY #003F
65EB 1808 914 INY
65ED 188C0040 915 CPY #0040
65F1 260F 916 BNE MPFLT11
917
65F3 18CE007F 918 LDY #007F
65F7 1808 919 INY
65F9 188C0080 920 CPY #0080
65FD 2603 921 BNE MPFLT11
65FF 7E6605 922 JMP LC20I
923
6602 7E7915 924 MPFLT11 JMP MPFLT
925
926
6605 18CE00FF 927 LC20I LDY #00FF
6609 1808 928 INY
660B 188C0100 929 CPY #0100
660F 26F1 930 BNE MPFLT11
6611 18CE01FF 931 LDY #01FF
6615 1808 932 INY
6617 188C0200 933 CPY #0200
661B 26E5 934 BNE MPFLT11
661D 18CE03FF 935 LDY #03FF
6621 1808 936 INY
6623 188C0400 937 CPY #0400
6627 26D9 938 BNE MPFLT11
6629 18CE07FF 939 LDY #07FF
662D 1808 940 INY
662F 188C0800 941 CPY #0800
6633 26CD 942 BNE MPFLT11
6635 18CE0FFF 943 LDY #0FFF
6639 1808 944 INY

```

```

663B 188C1000 945          CPY    #$1000
663F 26C1      946          BNE    MPFLT11
6641 18CE1FFF 947          LDY    #$1FFF
6645 1808      948          INY
6647 188C2000 949          CPY    #$2000
664B 26B5      950          BNE    MPFLT11
664D 18CE3FFF 951          LDY    #$3FFF
6651 1808      952          INY
6653 188C4000 953          CPY    #$4000
6657 26A9      954          BNE    MPFLT11
6659 18CE7FFF 955          LDY    #$7FFF
665D 1808      956          INY
665F 188C8000 957          CPY    #$8000
6663 269D      958          BNE    MPFLT11
6665 18CEFFFF 959          LDY    #$FFFF
6669 1808      960          INY
666B 188C0000 961          CPY    #$0000
666F 2691      962          BNE    MPFLT11
963
964
965
966 ;          TEST INC
967
6671 8600      968 L20C     LDAA   #$00
6673 9710      969         STAA   TEMP
6675 7C0010    970         INC    TEMP
6678 9610      971         LDAA   TEMP
667A 8101      972         CMPA   #$01
667C 266B      973         BNE    MPFLT12
974
667E 8601      975         LDAA   #$01
6680 9710      976         STAA   TEMP
6682 7C0010    977         INC    TEMP
6685 9610      978         LDAA   TEMP
6687 8102      979         CMPA   #$02
6689 265E      980         BNE    MPFLT12
981
668B 8603      982         LDAA   #$03
668D 9710      983         STAA   TEMP
668F 7C0010    984         INC    TEMP
6692 9610      985         LDAA   TEMP
6694 8104      986         CMPA   #$04
6696 2651      987         BNE    MPFLT12
988
6698 8607      989         LDAA   #$07
669A 9710      990         STAA   TEMP
669C 7C0010    991         INC    TEMP
669F 9610      992         LDAA   TEMP
66A1 8108      993         CMPA   #$08
66A3 2644      994         BNE    MPFLT12
995
66A5 860F      996         LDAA   #$0F
66A7 9710      997         STAA   TEMP
66A9 7C0010    998         INC    TEMP
66AC 9610      999         LDAA   TEMP
66AE 8110     1000        CMPA   #$10
66B0 2637     1001        BNE    MPFLT12
1002

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```

66B2 861F      1003      LDAA      #$1F
66B4 9710      1004      STAA      TEMP
66B6 7C0010    1005      INC       TEMP
66B9 9610      1006      LDAA      TEMP
66BB 8120      1007      CMPA     #$20
66BD 262A      1008      BNE      MPFLT12
1009
66BF 863F      1010      LDAA      #$3F
66C1 9710      1011      STAA      TEMP
66C3 7C0010    1012      INC       TEMP
66C6 9610      1013      LDAA      TEMP
66C8 8140      1014      CMPA     #$40
66CA 261D      1015      BNE      MPFLT12
1016
66CC 867F      1017      LDAA      #$7F
66CE 9710      1018      STAA      TEMP
66D0 7C0010    1019      INC       TEMP
66D3 9610      1020      LDAA      TEMP
66D5 8180      1021      CMPA     #$80
66D7 2610      1022      BNE      MPFLT12
1023
66D9 86FF      1024      LDAA      #$FF
66DB 9710      1025      STAA      TEMP
66DD 7C0010    1026      INC       TEMP
66E0 9610      1027      LDAA      TEMP
66E2 8100      1028      CMPA     #$00
66E4 2603      1029      BNE      MPFLT12
66E6 7E66EC    1030      JMP      L20D
1031
66E9 7E7915    1032      MPFLT12  JMP      MPFLT
1033
1034 ;          TEST THE DECREMENT INSTRUCTIONS NEXT
1035
1036 ;          TEST DECA
1037
66EC 8600      1038      L20D     LDAA      #$00
66EE 4A        1039      DECA
66EF 81FF      1040      CMPA     #$FF
66F1 263B      1041      BNE      MPFLT13
66F3 8680      1042      LDAA      #$80
66F5 4A        1043      DECA
66F6 817F      1044      CMPA     #$7F
66F8 2634      1045      BNE      MPFLT13
66FA 8640      1046      LDAA      #$40
66FC 4A        1047      DECA
66FD 813F      1048      CMPA     #$3F
66FF 262D      1049      BNE      MPFLT13
6701 8620      1050      LDAA      #$20
6703 4A        1051      DECA
6704 811F      1052      CMPA     #$1F
6706 2626      1053      BNE      MPFLT13
6708 8610      1054      LDAA      #$10
670A 4A        1055      DECA
670B 810F      1056      CMPA     #$0F
670D 261F      1057      BNE      MPFLT13
670F 8608      1058      LDAA      #$08
6711 4A        1059      DECA
6712 8107      1060      CMPA     #$07

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```

6714 2618      1061      BNE      MPFLT13
6716 8604      1062      LDAA     #$04
6718 4A        1063      DECA
6719 8103      1064      CMPA     #$03
671B 2611      1065      BNE      MPFLT13
671D 8602      1066      LDAA     #$02
671F 4A        1067      DECA
6720 8101      1068      CMPA     #$01
6722 260A      1069      BNE      MPFLT13
6724 8601      1070      LDAA     #$01
6726 4A        1071      DECA
6727 8100      1072      CMPA     #$00
6729 2603      1073      BNE      MPFLT13
672B 7E6731    1074      JMP      L20E
              1075
672E 7E7915    1076      MPFLT13  JMP      MPFLT
              1077
              1078
              1079 ;          TEST DECB
              1080
6731 C600      1081      L20E     LDAB     #$00
6733 5A        1082      DECB
6734 C1FF      1083      CMPB     #$FF
6736 263B      1084      BNE      MPFLT14
6738 C680      1085      LDAB     #$80
673A 5A        1086      DECB
673B C17F      1087      CMPB     #$7F
673D 2634      1088      BNE      MPFLT14
673F C640      1089      LDAB     #$40
6741 5A        1090      DECB
6742 C13F      1091      CMPB     #$3F
6744 262D      1092      BNE      MPFLT14
6746 C620      1093      LDAB     #$20
6748 5A        1094      DECB
6749 C11F      1095      CMPB     #$1F
674B 2626      1096      BNE      MPFLT14
674D C610      1097      LDAB     #$10
674F 5A        1098      DECB
6750 C10F      1099      CMPB     #$0F
6752 261F      1100      BNE      MPFLT14
6754 C608      1101      LDAB     #$08
6756 5A        1102      DECB
6757 C107      1103      CMPB     #$07
6759 2618      1104      BNE      MPFLT14
675B C604      1105      LDAB     #$04
675D 5A        1106      DECB
675E C103      1107      CMPB     #$03
6760 2611      1108      BNE      MPFLT14
6762 C602      1109      LDAB     #$02
6764 5A        1110      DECB
6765 C101      1111      CMPB     #$01
6767 260A      1112      BNE      MPFLT14
6769 C601      1113      LDAB     #$01
676B 5A        1114      DECB
676C C100      1115      CMPB     #$00
676E 2603      1116      BNE      MPFLT14
6770 7E6776    1117      JMP      L20G
              1118

```

```
6773 7E7915    1119 MPFLT14  JMP    MPFLT
              1120
              1121
              1122
              1123 ;          TEST DEY
              1124
              1125
6776 18CE0000  1126 L20G    LDY    #$0000
              1127
677A 1809      1128          DEY
677C 188CFFFF  1129          CPY    #$FFFF
6780 2663      1130          BNE    MPFLT16
6782 18CE8000  1131          LDY    #$8000
6786 1809      1132          DEY
6788 188C7FFF  1133          CPY    #$7FFF
678C 2657      1134          BNE    MPFLT16
678E 18CE4000  1135          LDY    #$4000
6792 1809      1136          DEY
6794 188C3FFF  1137          CPY    #$3FFF
6798 264B      1138          BNE    MPFLT16
679A 18CE2000  1139          LDY    #$2000
679E 1809      1140          DEY
67A0 188C1FFF  1141          CPY    #$1FFF
67A4 263F      1142          BNE    MPFLT16
67A6 18CE1000  1143          LDY    #$1000
67AA 1809      1144          DEY
67AC 188C0FFF  1145          CPY    #$0FFF
67B0 2633      1146          BNE    MPFLT16
67B2 18CE0800  1147          LDY    #$0800
67B6 1809      1148          DEY
67B8 188C07FF  1149          CPY    #$07FF
67BC 2627      1150          BNE    MPFLT16
67BE 18CE0400  1151          LDY    #$0400
67C2 1809      1152          DEY
67C4 188C03FF  1153          CPY    #$03FF
67C8 261B      1154          BNE    MPFLT16
67CA 18CE0200  1155          LDY    #$0200
67CE 1809      1156          DEY
67D0 188C01FF  1157          CPY    #$01FF
67D4 260F      1158          BNE    MPFLT16
67D6 18CE0100  1159          LDY    #$0100
67DA 1809      1160          DEY
67DC 188C00FF  1161          CPY    #$00FF
67E0 2603      1162          BNE    MPFLT16
67E2 7E67E8    1163          JMP    LC20K
              1164
67E5 7E7915    1165 MPFLT16  JMP    MPFLT
              1166
              1167
              1168
67E8 18CE0080  1169 LC20K   LDY    #$0080
67EC 1809      1170          DEY
67EE 188C007F  1171          CPY    #$007F
67F2 26F1      1172          BNE    MPFLT16
67F4 18CE0040  1173          LDY    #$0040
67F8 1809      1174          DEY
67FA 188C003F  1175          CPY    #$003F
67FE 26E5      1176          BNE    MPFLT16
```

```
6800 18CE0020 1177      LDY      #$0020
6804 1809      1178      DEY
6806 188C001F 1179      CPY      #$001F
680A 26D9      1180      BNE      MPFLT16
        1181
680C 18CE0010 1182      LDY      #$0010
6810 1809      1183      DEY
6812 188C000F 1184      CPY      #$000F
6816 26CD      1185      BNE      MPFLT16
6818 18CE0008 1186      LDY      #$0008
681C 1809      1187      DEY
681E 188C0007 1188      CPY      #$0007
6822 26C1      1189      BNE      MPFLT16
6824 18CE0004 1190      LDY      #$0004
6828 1809      1191      DEY
682A 188C0003 1192      CPY      #$0003
682E 26B5      1193      BNE      MPFLT16
6830 18CE0002 1194      LDY      #$0002
6834 1809      1195      DEY
6836 188C0001 1196      CPY      #$0001
683A 26A9      1197      BNE      MPFLT16
683C 18CE0001 1198      LDY      #$0001
6840 1809      1199      DEY
6842 188C0000 1200      CPY      #$0000
6846 269D      1201      BNE      MPFLT16
        1202
        1203
        1204
        1205 ;      TEST DEC
        1206
6848 8600      1207      LDAA     #$00
684A 9710      1208      STAA     TEMP
684C 7A0010    1209      DEC      TEMP
684F 9610      1210      LDAA     TEMP
6851 81FF      1211      CMPA     #$FF
6853 266B      1212      BNE      MPFLT17
        1213
6855 8680      1214      LDAA     #$80
6857 9710      1215      STAA     TEMP
6859 7A0010    1216      DEC      TEMP
685C 9610      1217      LDAA     TEMP
685E 817F      1218      CMPA     #$7F
6860 265E      1219      BNE      MPFLT17
        1220
6862 8640      1221      LDAA     #$40
6864 9710      1222      STAA     TEMP
6866 7A0010    1223      DEC      TEMP
6869 9610      1224      LDAA     TEMP
686B 813F      1225      CMPA     #$3F
686D 2651      1226      BNE      MPFLT17
        1227
686F 8620      1228      LDAA     #$20
6871 9710      1229      STAA     TEMP
6873 7A0010    1230      DEC      TEMP
6876 9610      1231      LDAA     TEMP
6878 811F      1232      CMPA     #$1F
687A 2644      1233      BNE      MPFLT17
        1234
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687C 8610      1235      LDAA    #$10
687E 9710      1236      STAA    TEMP
6880 7A0010    1237      DEC     TEMP
6883 9610      1238      LDAA    TEMP
6885 810F      1239      CMPA   #$0F
6887 2637      1240      BNE    MPFLT17
        1241
6889 8608      1242      LDAA    #$08
688B 9710      1243      STAA    TEMP
688D 7A0010    1244      DEC     TEMP
6890 9610      1245      LDAA    TEMP
6892 8107      1246      CMPA   #$07
6894 262A      1247      BNE    MPFLT17
        1248
6896 8604      1249      LDAA    #$04
6898 9710      1250      STAA    TEMP
689A 7A0010    1251      DEC     TEMP
689D 9610      1252      LDAA    TEMP
689F 8103      1253      CMPA   #$03
68A1 261D      1254      BNE    MPFLT17
        1255
68A3 8602      1256      LDAA    #$02
68A5 9710      1257      STAA    TEMP
68A7 7A0010    1258      DEC     TEMP
68AA 9610      1259      LDAA    TEMP
68AC 8101      1260      CMPA   #$01
68AE 2610      1261      BNE    MPFLT17
        1262
68B0 8601      1263      LDAA    #$01
68B2 9710      1264      STAA    TEMP
68B4 7A0010    1265      DEC     TEMP
68B7 9610      1266      LDAA    TEMP
68B9 8100      1267      CMPA   #$00
68BB 2603      1268      BNE    MPFLT17
68BD 7E68C3    1269      JMP     LOC20A
        1270
68C0 7E7915    1271      MPFLT17 JMP     MPFLT
        1272
        1273 ;      NOW THOROUGHLY TEST WHETHER ACCUMULATORS A AND B ARE
        1274 ;      UNIQUE , AND DATA PATHS BETWEEN THE TWO EXIST
        1275
68C3 CC0000    1276      LOC20A LDD     #$00
68C6 9710      1277      STAA    TEMP
        1278
68C8 4C        1279      LOC20  INCA
        1280 ;TEST OF ACCUMULATOR A FOR EACH VALUE
        1281 ;WHILE INCREMENTING
68C9 7C0010    1281      INC     TEMP ; GIVE A COPY OF THE CURRENT VALUE TO
        1282 ; TEMP ALSO
68CC 9110      1282      CMPA   TEMP ;COMPLETE VALUE IS PRESENT AT THIS
        1283 ;LOCATION
68CE 2633      1283      BNE    MPFLT18
68D0 C100      1284      CMPB   #00 ;CONFIRM THE CONTENTS OF B
68D2 262F      1285      BNE    MPFLT18
68D4 81FF      1286      CMPA   #$FF ;CHECK WHETHER MAXIMUM VALUE IS REACHED

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68D6 26F0      1287          BNE      LOC20
               1288
68D8 C600      1289          LDAB     #$00          ;NOW INCREMENT B AND
               ;REPEAT THE SAME
68DA D710      1290          STAB     TEMP         ;PROCEDURE
               1291
68DC 5C        1292          LOC21      INCB
68DD 7C0010    1293          INC      TEMP
68E0 D110      1294          CMPB     TEMP
68E2 261F      1295          BNE      MPFLT18
68E4 81FF      1296          CMPA     #$FF         ;THE VALUE PRESENT IN
               ;A DURING THIS TEST IS FF
68E6 261B      1297          BNE      MPFLT18
68E8 C1FF      1298          CMPB     #$FF
68EA 26F0      1299          BNE      LOC21
               1300
68EC 86FF      1301          LDAA     #$FF         ;TEST OF ACCUMULATOR A FOR EACH VALUE
68EE 9710      1302          STAA     TEMP         ;WHILE DECREMENTING
               1303
68F0 4A        1304          LOC22      DECA
68F1 7A0010    1305          DEC      TEMP
68F4 9110      1306          CMPA     TEMP
68F6 260B      1307          BNE      MPFLT18
68F8 C1FF      1308          CMPB     #$FF         ;THE VALUE PRESENT IN B DURING THIS TEST
               ;IS FF
68FA 2607      1309          BNE      MPFLT18
68FC 8100      1310          CMPA     #$00
68FE 26F0      1311          BNE      LOC22
6900 7E6906    1312          JMP      LC22A
               1313
6903 7E7915    1314          MPFLT18   JMP      MPFLT
               1315
6906 C6FF      1316          LC22A     LDAB     #$FF         ;NOW DECREMENT B AND REPEAT THE SAME
6908 D710      1317          STAB     TEMP         ;PROCEDURE
               1318
690A 5A        1319          LOC23      DECB
690B 7A0010    1320          DEC      TEMP
690E D110      1321          CMPB     TEMP
6910 26F1      1322          BNE      MPFLT18
6912 8100      1323          CMPA     #$00         ;THE VALUE PRESENT IN A DURING THIS TEST
               ;IS 00
6914 26ED      1324          BNE      MPFLT18
6916 C100      1325          CMPB     #$00
6918 26F0      1326          BNE      LOC23
               1327
691A CC0000    1328          LDD      #$00         ;TESTING TAB INSTRUCTION
691D 9710      1329          STAA     TEMP
691F 4C        1330          LOC24      INCA
6920 7C0010    1331          INC      TEMP
6923 16        1332          TAB
6924 D110      1333          CMPB     TEMP
6926 260B      1334          BNE      MPFLT19
6928 9110      1335          CMPA     TEMP
692A 2607      1336          BNE      MPFLT19

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692C 81FF      1337          CMPA    #$FF
692E 26EF      1338          BNE     LOC24
6930 7E6936    1339          JMP     LC24AA
1340
6933 7E7915    1341 MPFLT19  JMP     MPFLT
1342
1343
1344
1345          LC24AA
6936 CC0000    1346          LDD     #$0000      ;TESTING TBA INSTRUCTION
6939 9710      1347          STAA   TEMP
693B 5C        1348          LC24A   INCB
693C 7C0010    1349          INC     TEMP
693F 17        1350          TBA
6940 9110      1351          CMPA   TEMP
6942 260B     1352          BNE    MPFLT20
6944 D110     1353          CMPB   TEMP
6946 2607     1354          BNE    MPFLT20
6948 C1FF     1355          CMPB   #$FF
694A 26EF     1356          BNE    LC24A
694C 7E6952   1357          JMP    LC24AB
1358
694F 7E7915   1359 MPFLT20  JMP    MPFLT
1360
1361 ;          TESTING ACCUMULATOR CLEAR INSTRUCTIONS
1362 ;          TEST CLRA
1363
6952 86FF     1364          LC24AB  LDAA   #$FF
6954 4F      1365          CLRA
6955 8100     1366          CMPA   #$00
6957 2603     1367          BNE    MPFLT21
6959 7E695F   1368          JMP    LC24AC
1369
695C 7E7915   1370 MPFLT21  JMP    MPFLT
1371
1372 ;          TESTING ACCUMULATOR CLEAR INSTRUCTION
1373 ;          TEST CLRB
1374
695F C6FF     1375          LC24AC  LDAB   #$FF
6961 5F      1376          CLRB
6962 C100     1377          CMPB   #$00
6964 2603     1378          BNE    MPFLT22
6966 7E696C   1379          JMP    LC24AD
1380
6969 7E7915   1381 MPFLT22  JMP    MPFLT
1382
1383
1384 ;          TEST BRA
696C 2003     1385          LC24AD  BRA    L24
1386
696E 7E7915   1387 MPFLT100 JMP    MPFLT
1388
1389 ;          TESTING TAP,TPA AND BRANCH INSTRUCTIONS
1390
6971 86FF     1391          L24     LDAA   #$FF
6973 06      1392          TAP
6974 07      1393          TPA      ;TAP TESTED
           ;TPA TESTED

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6975 81FF      1394          CMPA    #$FF
6977 2603      1395          BNE     L24A1
6979 7E6986    1396          JMP     L21B
697C 81BF      1397 L24A1     CMPA    #$BF
697E 2603      1398          BNE     MPFLT23
6980 7E6986    1399          JMP     L21B
        1400
6983 7E7915    1401 MPFLT23    JMP     MPFLT
        1402
6986 86FF      1403 L21B      LDAA    #$FF
6988 06         1404          TAP
        1405
6989 2703      1406          BEQ     LC24D          ;BEQ TESTED
698B 7E6983    1407          JMP     MPFLT23
        1408
698E 2C03      1409 LC24D     BGE     LC24E          ;BGE TESTED
6990 7E6983    1410          JMP     MPFLT23
6993 2F03      1411 LC24E     BLE     LC24F          ;BLE TESTED
6995 7E6983    1412          JMP     MPFLT23
6998 2503      1413 LC24F     BLO     LC24G          ;BLO TESTED
699A 7E6983    1414          JMP     MPFLT23
699D 2303      1415 LC24G     BLS     LC24H          ;BLS TESTED
699F 7E6983    1416          JMP     MPFLT23
69A2 2B03      1417 LC24H     BMI     LC24I          ;BMI TESTED
69A4 7E6983    1418          JMP     MPFLT23
69A7 2503      1419 LC24I     BCS     LC24J          ;BCS TESTED
69A9 7E6983    1420          JMP     MPFLT23
69AC 2903      1421 LC24J     BVS     LC24K          ;BVS TESTED
69AE 7E6983    1422          JMP     MPFLT23
        1423
        1424
69B1 240F      1425 LC24K     BCC     MPFLT32        ;BCC TESTED
69B3 2E0D      1426          BGT     MPFLT32        ;BGT TESTED
69B5 220B      1427          BHI     MPFLT32        ;BHI TESTED
69B7 2409      1428          BHS     MPFLT32        ;BHS TESTED
69B9 2607      1429          BNE     MPFLT32        ;BNE TESTED
69BB 2A05      1430          BPL     MPFLT32        ;BPL TESTED
69BD 2803      1431          BVC     MPFLT32        ;BVC TESTED
69BF 7E69C5    1432          JMP     L21A
        1433
        1434
        1435
69C2 7E7915    1436 MPFLT32    JMP     MPFLT
        1437
        1438
        1439 ;          NOW, ALL THE FLAGS ARE MADE ZERO, AND THE BRANCH CONDITIONS
        1440 ;          ARE AGAIN TESTED
        1441
69C5 8600      1442 L21A      LDAA    #$00
69C7 06         1443          TAP
        1444
69C8 2403      1445 L21C     BCC     LC25A          ;BCC TESTED
69CA 7E69C2    1446          JMP     MPFLT32
69CD 2E03      1447 LC25A     BGT     LC25B          ;BGT TESTED
69CF 7E69C2    1448          JMP     MPFLT32
69D2 2203      1449 LC25B     BHI     LC25C          ;BHI TESTED
69D4 7E69C2    1450          JMP     MPFLT32

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69D7 2403      1451 LC25C   BHS    LC25D           ;BHS TESTED
69D9 7E69C2   1452                JMP    MPFLT32
69DC 2603      1453 LC25D   BNE    LC25E           ;BNE TESTED
69DE 7E69C2   1454                JMP    MPFLT32
69E1 2A03      1455 LC25E   BPL    LC25F           ;BPL TESTED
69E3 7E69C2   1456                JMP    MPFLT32
69E6 2803      1457 LC25F   BVC    LC25G           ;BVC TESTED
69E8 7E69C2   1458                JMP    MPFLT32
1459
69EB 2C03      1460 LC25G   BGE    LC25GG          ;BGE TESTED
69ED 7E6A03   1461                JMP    MPFLT33          ;BGE TESTED
69F0 2511      1462 LC25GG  BCS    MPFLT33          ;BCS TESTED
69F2 270F      1463                BEQ    MPFLT33          ;BEQ TESTED
1464
69F4 2F0D      1465                BLE    MPFLT33          ;BLE TESTED
69F6 250B      1466                BLO    MPFLT33          ;BLO TESTED
69F8 2309      1467                BLS    MPFLT33          ;BLS TESTED
69FA 2B07      1468                BMI    MPFLT33          ;BMI TESTED
69FC 2905      1469                BVS    MPFLT33          ;BVS TESTED
69FE 2103      1470                BRN    MPFLT33          ;BRN TESTED
6A00 7E6A06   1471                JMP    L21D
1472
6A03 7E7915   1473 MPFLT33 JMP    MPFLT
1474
1475
1476
1477
1478
1479
1480
1481 ;          TESTING ADD INSTRUCTIONS
1482
1483 ;          TESTING ADDA
1484
6A06 86FF      1485 L21D    LDAA   #$FF
6A08 8BFF      1486                ADDA   #$FF
6A0A 81FE      1487                CMPA   #$FE
6A0C 261B      1488                BNE    MPFLT50
1489
6A0E 86AA      1490                LDAA   #$AA
6A10 8B55      1491                ADDA   #$55
6A12 81FF      1492                CMPA   #$FF
6A14 2613      1493                BNE    MPFLT50
1494
6A16 8655      1495                LDAA   #$55
6A18 8BAA      1496                ADDA   #$AA
6A1A 81FF      1497                CMPA   #$FF
6A1C 260B      1498                BNE    MPFLT50
1499
6A1E 8600      1500                LDAA   #$00
6A20 8B00      1501                ADDA   #$00
6A22 8100      1502                CMPA   #$00
6A24 2603      1503                BNE    MPFLT50
6A26 7E6A2C   1504                JMP    L21DD
1505
1506
6A29 7E7915   1507 MPFLT50 JMP    MPFLT
1508

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1509 ;          TESTING ADDB
1510
6A2C C6FF      1511 L21DD      LDAB    $$FF
6A2E CBFF      1512           ADDB    $$FF
6A30 C1FE      1513           CMPB    $$FE
6A32 261B      1514           BNE     MPFLT51
1515
6A34 C6AA      1516           LDAB    $$AA
6A36 CB55      1517           ADDB    $$55
6A38 C1FF      1518           CMPB    $$FF
6A3A 2613      1519           BNE     MPFLT51
1520
6A3C C655      1521           LDAB    $$55
6A3E CBAA      1522           ADDB    $$AA
6A40 C1FF      1523           CMPB    $$FF
6A42 260B      1524           BNE     MPFLT51
1525
6A44 C600      1526           LDAB    $$00
6A46 CB00      1527           ADDB    $$00
6A48 C100      1528           CMPB    $$00
6A4A 2603      1529           BNE     MPFLT51
6A4C 7E6A52    1530           JMP     L21E
1531
6A4F 7E7915    1532 MPFLT51    JMP     MPFLT
1533
1534
1535 ;          TESTING ADDD
1536
6A52 CC5555    1537 L21E      LDD     $$5555
6A55 C3AAAA    1538           ADDD    $$AAAA
6A58 1A83FFFF  1539           CPD     $$FFFF
6A5C 2627      1540           BNE     MPFLT51A
1541
6A5E CCAAAA    1542           LDD     $$AAAA
6A61 C35555    1543           ADDD    $$5555
6A64 1A83FFFF  1544           CPD     $$FFFF
6A68 261B      1545           BNE     MPFLT51A
1546
6A6A CCFFFF    1547           LDD     $$FFFF
6A6D C3FFFF    1548           ADDD    $$FFFF
6A70 1A83FFFE  1549           CPD     $$FFFE
6A74 260F      1550           BNE     MPFLT51A
1551
6A76 CC0000    1552           LDD     $$0000
6A79 C30000    1553           ADDD    $$0000
6A7C 1A830000  1554           CPD     $$0000
6A80 2603      1555           BNE     MPFLT51A
6A82 7E6A88    1556           JMP     L21EE
1557
6A85 7E7915    1558 MPFLT51A  JMP     MPFLT
1559
1560
1561 ;          TESTING ADD B TO A INSTRUCTION
1562
6A88 CC55AA    1563 L21EE    LDD     $$55AA
6A8B 1B        1564           ABA
6A8C 81FF      1565           CMPA    $$FF
6A8E 261B      1566           BNE     MPFLT52

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1567
1568
6A90 CCAA55 1569 LDD #AA55
6A93 1B 1570 ABA
6A94 81FF 1571 CMPA #FF
6A96 2613 1572 BNE MPFLT52
1573
6A98 CFFFFF 1574 LDD #FFFF
6A9B 1B 1575 ABA
6A9C 81FE 1576 CMPA #FE
6A9E 260B 1577 BNE MPFLT52
1578
6AA0 CC0000 1579 LDD #0000
6AA3 1B 1580 ABA
6AA4 8100 1581 CMPA #00
6AA6 2603 1582 BNE MPFLT52
6AA8 7E6AAE 1583 JMP L21F
1584
6AAB 7E7915 1585 MPFLT52 JMP MPFLT
1586
1587
1588 ; TESTING ADD B TO X INSTRUCTION
1589
6AAE CE5555 1590 L21F LDX #5555
6AB1 C6AA 1591 LDAB #AA
6AB3 3A 1592 ABX
6AB4 8C55FF 1593 CPX #55FF
6AB7 2624 1594 BNE MPFLT53
1595
6AB9 CEAAAA 1596 LDX #AAAA
6ABC C655 1597 LDAB #55
6ABE 3A 1598 ABX
6ABF 8CAAFF 1599 CPX #AAFF
6AC2 2619 1600 BNE MPFLT53
1601
6AC4 CEFFFF 1602 LDX #FFFF
6AC7 C6FF 1603 LDAB #FF
6AC9 3A 1604 ABX
6ACA 8C00FE 1605 CPX #00FE
6ACD 260E 1606 BNE MPFLT53
1607
6ACF CE0000 1608 LDX #0000
6AD2 C600 1609 LDAB #00
6AD4 3A 1610 ABX
6AD5 8C0000 1611 CPX #0000
6AD8 2603 1612 BNE MPFLT53
6ADA 7E6AE0 1613 JMP L21G
1614
6ADD 7E7915 1615 MPFLT53 JMP MPFLT
1616
1617 ; TESTING ADD B TO Y INSTRUCTION
1618
1619
6AE0 18CE5555 1620 L21G LDY #5555
6AE4 C6AA 1621 LDAB #AA
6AE6 183A 1622 ABY
6AE8 188C55FF 1623 CPY #55FF
6AEC 262D 1624 BNE MPFLT54

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1625
6AE E 18CEAAAA 1626          LDY      #$AAAA
6AF 2 C655      1627          LDAB     #$55
6AF 4 183A      1628          ABY
6AF 6 188CAAFF 1629          CPY      #$AAFF
6AF A 261F      1630          BNE      MPFLT54
1631
6AF C 18CEFFFF 1632          LDY      #$FFFF
6B0 0 C6FF      1633          LDAB     #$FF
6B0 2 183A      1634          ABY
6B0 4 188C00FE 1635          CPY      #$00FE
6B0 8 2611      1636          BNE      MPFLT54
1637
6B0 A 18CE0000 1638          LDY      #$0000
6B0 E C600      1639          LDAB     #$00
6B1 0 183A      1640          ABY
6B1 2 188C0000 1641          CPY      #$0000
6B1 6 2603      1642          BNE      MPFLT54
6B1 8 7E6B1E    1643          JMP      L21H
1644
6B1 B 7E7915    1645          MPFLT54 JMP      MPFLT
1646
1647
1648 ;          TESTING SUBTRACT INSTRUCTION
1649
1650 ;          TEST SUBA
1651
6B1 E 86FF      1652          L21H    LDAA     #$FF
6B2 0 80FF      1653          SUBA     #$FF
6B2 2 8100      1654          CMPA     #$00
6B2 4 261B      1655          BNE      MPFLT55
1656
6B2 6 86AA      1657          LDAA     #$AA
6B2 8 8055      1658          SUBA     #$55
6B2 A 8155      1659          CMPA     #$55
6B2 C 2613      1660          BNE      MPFLT55
1661
6B2 E 8655      1662          LDAA     #$55
6B3 0 80AA      1663          SUBA     #$AA
6B3 2 81AB      1664          CMPA     #$AB
6B3 4 260B      1665          BNE      MPFLT55
1666
6B3 6 8600      1667          LDAA     #$00
6B3 8 8000      1668          SUBA     #$00
6B3 A 8100      1669          CMPA     #$00
6B3 C 2603      1670          BNE      MPFLT55
6B3 E 7E6B44    1671          JMP      L21J
1672
1673
1674
1675
6B4 1 7E7915    1676          MPFLT55 JMP      MPFLT
1677
1678
1679 ;          TEST SUBB
1680
6B4 4 C6FF      1681          L21J    LDAB     #$FF
6B4 6 C0FF      1682          SUBB     #$FF

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6B48 C100      1683      CMPB    #$00
6B4A 261B      1684      BNE     MPFLT56
                1685
6B4C C6AA      1686      LDAB   #$AA
6B4E C055      1687      SUBB   #$55
6B50 C155      1688      CMPB   #$55
6B52 2613      1689      BNE     MPFLT56
                1690
6B54 C655      1691      LDAB   #$55
6B56 C0AA      1692      SUBB   #$AA
6B58 C1AB      1693      CMPB   #$AB
6B5A 260B      1694      BNE     MPFLT56
                1695
6B5C C600      1696      LDAB   #$00
6B5E C000      1697      SUBB   #$00
6B60 C100      1698      CMPB   #$00
6B62 2603      1699      BNE     MPFLT56
6B64 7E6B6A    1700      JMP     L21K
                1701
                1702
                1703
                1704
6B67 7E7915    1705      MPFLT56 JMP     MPFLT
                1706
                1707 ;          TEST SUBD
                1708
6B6A CCFFFF    1709      L21K    LDD     #$FFFF
6B6D 83FFFF    1710      SUBD   #$FFFF
6B70 1A830000  1711      CPD    #$0000
6B74 2627      1712      BNE     MPFLT57
                1713
6B76 CC0000    1714      LDD     #$0000
6B79 830000    1715      SUBD   #$0000
6B7C 1A830000  1716      CPD    #$0000
6B80 261B      1717      BNE     MPFLT57
                1718
6B82 CCAAAA    1719      LDD     #$AAAA
6B85 835555    1720      SUBD   #$5555
6B88 1A835555  1721      CPD    #$5555
6B8C 260F      1722      BNE     MPFLT57
                1723
6B8E CC5555    1724      LDD     #$5555
6B91 83AAAA    1725      SUBD   #$AAAA
6B94 1A83AAAB  1726      CPD    #$AAAB
6B98 2603      1727      BNE     MPFLT57
6B9A 7E6BA0    1728      JMP     L21L
                1729
6B9D 7E7915    1730      MPFLT57 JMP     MPFLT
                1731
                1732
                1733 ;          TESTING SBA
                1734
6BA0 CCFFFF    1735      L21L    LDD     #$FFFF
6BA3 10        1736      SBA
6BA4 8100      1737      CMPA   #$00
6BA6 261B      1738      BNE     MPFLT58
                1739
6BA8 CCAA55    1740      LDD     #$AA55

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6BAB 10          1741          SBA
6BAC 8155       1742          CMPA    #$55
6BAE 2613       1743          BNE     MPFLT58
                1744
6BB0 CC55AA    1745          LDD     #$55AA
6BB3 10         1746          SBA
6BB4 81AB       1747          CMPA    #$AB
6BB6 260B       1748          BNE     MPFLT58
                1749
6BB8 CC0000    1750          LDD     #$0000
6BBB 10         1751          SBA
6BBC 8100       1752          CMPA    #$00
6BBE 2603       1753          BNE     MPFLT58
6BC0 7E6BC6    1754          JMP     L21LL
                1755
6BC3 7E7915    1756  MPFLT58  JMP     MPFLT
                1757
                1758
                1759 ;          TESTING ADD WITH CARRY INSTRUCTION
                1760
                1761 ;          TESTING ADCA
                1762
6BC6 0C         1763  L21LL    CLC
6BC7 CCFFFF    1764          LDD     #$FFFF
6BCA D710       1765          STAB   TEMP
6BCC 9910       1766          ADCA   TEMP
6BCE 81FE       1767          CMPA   #$FE
6BD0 2657       1768          BNE     MPFLT59
                1769
6BD2 0D         1770          SEC
6BD3 CCFFFF    1771          LDD     #$FFFF
6BD6 D710       1772          STAB   TEMP
6BD8 9910       1773          ADCA   TEMP
6BDA 81FF       1774          CMPA   #$FF
6BDC 264B       1775          BNE     MPFLT59
                1776
                1777
6BDE 0C         1778          CLC
6BDF CC0000    1779          LDD     #$0000
6BE2 D710       1780          STAB   TEMP
6BE4 9910       1781          ADCA   TEMP
6BE6 8100       1782          CMPA   #$00
6BE8 263F       1783          BNE     MPFLT59
                1784
6BEA 0D         1785          SEC
6BEB CC0000    1786          LDD     #$0000
6BEE D710       1787          STAB   TEMP
6BF0 9910       1788          ADCA   TEMP
6BF2 8101       1789          CMPA   #$01
6BF4 2633       1790          BNE     MPFLT59
                1791
6BF6 0C         1792          CLC
6BF7 CCAA55    1793          LDD     #$AA55
6BFA D710       1794          STAB   TEMP
6BFC 9910       1795          ADCA   TEMP
6BFE 81FF       1796          CMPA   #$FF
6C00 2627       1797          BNE     MPFLT59
                1798

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6C02 0D      1799      SEC
6C03 CCAA55  1800      LDD      $$AA55
6C06 D710    1801      STAB     TEMP
6C08 9910    1802      ADCA    TEMP
6C0A 8100    1803      CMPA    $$00
6C0C 261B    1804      BNE     MPFLT59
        1805
6C0E 0C      1806      CLC
6C0F CC55AA  1807      LDD     $$55AA
6C12 D710    1808      STAB     TEMP
6C14 9910    1809      ADCA    TEMP
6C16 81FF    1810      CMPA    $$FF
6C18 260F    1811      BNE     MPFLT59
        1812
6C1A 0D      1813      SEC
6C1B CC55AA  1814      LDD     $$55AA
6C1E D710    1815      STAB     TEMP
6C20 9910    1816      ADCA    TEMP
6C22 8100    1817      CMPA    $$00
6C24 2603    1818      BNE     MPFLT59
6C26 7E6C2C  1819      JMP     L21N
        1820
        1821
6C29 7E7915  1822      MPFLT59 JMP     MPFLT
        1823
        1824 ;          TESTING SUBTRACT WITH BORROW INSTRUCTION
        1825 ;
        1826 ;          TEST SBCA
        1827
6C2C 0C      1828      L21N    CLC
6C2D CCFFFF  1829      LDD     $$FFFF
6C30 D710    1830      STAB     TEMP
6C32 9210    1831      SBCA    TEMP
6C34 8100    1832      CMPA    $$00
6C36 2657    1833      BNE     MPFLT61
        1834
6C38 0D      1835      SEC
6C39 CCFFFF  1836      LDD     $$FFFF
6C3C D710    1837      STAB     TEMP
6C3E 9210    1838      SBCA    TEMP
6C40 81FF    1839      CMPA    $$FF
6C42 264B    1840      BNE     MPFLT61
        1841
        1842
6C44 0C      1843      CLC
6C45 CC0000  1844      LDD     $$0000
6C48 D710    1845      STAB     TEMP
6C4A 9210    1846      SBCA    TEMP
6C4C 8100    1847      CMPA    $$00
6C4E 263F    1848      BNE     MPFLT61
        1849
6C50 0D      1850      SEC
6C51 CC0000  1851      LDD     $$0000
6C54 D710    1852      STAB     TEMP
6C56 9210    1853      SBCA    TEMP
6C58 81FF    1854      CMPA    $$FF
6C5A 2633    1855      BNE     MPFLT61
        1856

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6C5C 0C          1857          CLC
6C5D CCAA55     1858          LDD    #$AA55
6C60 D710       1859          STAB   TEMP
6C62 9210       1860          SBCA   TEMP
6C64 8155       1861          CMPA   #$55
6C66 2627       1862          BNE    MPFLT61
                1863
6C68 0D         1864          SEC
6C69 CCAA55     1865          LDD    #$AA55
6C6C D710       1866          STAB   TEMP
6C6E 9210       1867          SBCA   TEMP
6C70 8154       1868          CMPA   #$54
6C72 261B       1869          BNE    MPFLT61
                1870
6C74 0C         1871          CLC
6C75 CC55AA     1872          LDD    #$55AA
6C78 D710       1873          STAB   TEMP
6C7A 9210       1874          SBCA   TEMP
6C7C 81AB       1875          CMPA   #$AB
6C7E 260F       1876          BNE    MPFLT61
                1877
6C80 0D         1878          SEC
6C81 CC55AA     1879          LDD    #$55AA
6C84 D710       1880          STAB   TEMP
6C86 9210       1881          SBCA   TEMP
6C88 81AA       1882          CMPA   #$AA
6C8A 2603       1883          BNE    MPFLT61
                1884
                1885
6C8C 7E6C92     1886          JMP    L21P
                1887
6C8F 7E7915     1888 MPFLT61  JMP    MPFLT
                1889
                1890 ;          TEST SBCB
                1891
6C92 0C         1892 L21P     CLC
6C93 CCFFFF     1893          LDD    #$FFFF
6C96 9710       1894          STAA   TEMP
6C98 D210       1895          SBCB   TEMP
6C9A C100       1896          CMPB   #$00
6C9C 2657       1897          BNE    MPFLT62
                1898
6C9E 0D         1899          SEC
6C9F CCFFFF     1900          LDD    #$FFFF
6CA2 9710       1901          STAA   TEMP
6CA4 D210       1902          SBCB   TEMP
6CA6 C1FF       1903          CMPB   #$FF
6CA8 264B       1904          BNE    MPFLT62
                1905
                1906
6CAA 0C         1907          CLC
6CAB CC0000     1908          LDD    #$0000
6CAE 9710       1909          STAA   TEMP
6CB0 D210       1910          SBCB   TEMP
6CB2 C100       1911          CMPB   #$00
6CB4 263F       1912          BNE    MPFLT62
                1913
6CB6 0D         1914          SEC

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6CB7 CC0000 1915 LDD #0000
6CBA 9710 1916 STAA TEMP
6CBC D210 1917 SBCB TEMP
6CBE C1FF 1918 CMPB #FF
6CC0 2633 1919 BNE MPFLT62
1920
6CC2 0C 1921 CLC
6CC3 CCAA55 1922 LDD #AA55
6CC6 9710 1923 STAA TEMP
6CC8 D210 1924 SBCB TEMP
6CCA C1AB 1925 CMPB #AB
6CCC 2627 1926 BNE MPFLT62
1927
6CCE 0D 1928 SEC
6CCF CCAA55 1929 LDD #AA55
6CD2 9710 1930 STAA TEMP
6CD4 D210 1931 SBCB TEMP
6CD6 C1AA 1932 CMPB #AA
6CD8 261B 1933 BNE MPFLT62
1934
6CDA 0C 1935 CLC
6CDB CC55AA 1936 LDD #55AA
6CDE 9710 1937 STAA TEMP
6CE0 D210 1938 SBCB TEMP
6CE2 C155 1939 CMPB #55
6CE4 260F 1940 BNE MPFLT62
1941
6CE6 0D 1942 SEC
6CE7 CC55AA 1943 LDD #55AA
6CEA 9710 1944 STAA TEMP
6CEC D210 1945 SBCB TEMP
6CEE C154 1946 CMPB #54
6CF0 2603 1947 BNE MPFLT62
1948
6CF2 7E6CF8 1949 JMP L21Q
1950
6CF5 7E7915 1951 MPFLT62 JMP MPFLT
1952
1953
1954 ; TESTING MULTIPLY INSTRUCTION
6CF8 0C 1955 L21Q CLC
6CF9 CCFFFF 1956 LDD #FFFF
6CFC 3D 1957 MUL
6CFD 1A83FE01 1958 CPD #FE01
6D01 2622 1959 BNE MPFLT63
1960
1961
6D03 CC5555 1962 LDD #5555
6D06 3D 1963 MUL
6D07 1A831C39 1964 CPD #1C39
6D0B 2618 1965 BNE MPFLT63
1966
1967
6D0D CC0FF0 1968 LDD #0FF0
6D10 3D 1969 MUL
6D11 1A830E10 1970 CPD #0E10
6D15 260E 1971 BNE MPFLT63
1972

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6D17 0C      1973 LC33A   CLC
6D18 CCAAAA  1974      LDD    #$AAAA
6D1B 3D      1975      MUL
6D1C 1A8370E4 1976      CPD    #$70E4
6D20 2603    1977      BNE    MPFLT63
6D22 7E6D28  1978      JMP    L21R
        1979
6D25 7E7915  1980 MPFLT63  JMP    MPFLT
        1981
        1982
        1983
        1984 ;          TESTING DIVIDE INSTRUCTION
        1985
6D28 CFFFFFF  1986 L21R    LDD    #$FFFF
6D2B CFFFFFF  1987      LDX    #$FFFF
6D2E 02      1988      IDIV
6D2F 8C0001  1989      CPX    #$0001
6D32 2622    1990      BNE    MPFLT65
6D34 1A830000 1991      CPD    #$0000
6D38 261C    1992      BNE    MPFLT65
        1993
        1994
6D3A CCAAAA  1995 LC33B   LDD    #$AAAA
6D3D CE5555  1996      LDX    #$5555
6D40 02      1997      IDIV
6D41 8C0002  1998      CPX    #$0002
6D44 2610    1999      BNE    MPFLT65
        2000
6D46 0C      2001      CLC
6D47 CC5555  2002      LDD    #$5555
6D4A CEAAAA  2003      LDX    #$AAAA
6D4D 02      2004      IDIV
6D4E 8C0000  2005      CPX    #$0000
6D51 2603    2006      BNE    MPFLT65
6D53 7E6D59  2007      JMP    L21S
        2008
6D56 7E7915  2009 MPFLT65  JMP    MPFLT
        2010
        2011
        2012 ;          TESTING DAA INSTRUCTION
6D59 CC6699  2013 L21S    LDD    #$6699
6D5C 1B      2014      ABA
6D5D 19      2015      DAA
6D5E 8165    2016      CMPA   #$65
6D60 261E    2017      BNE    MPFLT66
        2018
6D62 CC9966  2019      LDD    #$9966
6D65 1B      2020      ABA
6D66 19      2021      DAA
6D67 8165    2022      CMPA   #$65
6D69 2615    2023      BNE    MPFLT66
        2024
6D6B CC6666  2025      LDD    #$6666
6D6E 1B      2026      ABA
6D6F 19      2027      DAA
6D70 8132    2028      CMPA   #$32
6D72 260C    2029      BNE    MPFLT66
        2030

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6D74 CC9999      2031          LDD      #$9999
6D77 1B          2032          ABA
6D78 19          2033          DAA
6D79 8198        2034          CMPA     #$98
6D7B 2603        2035          BNE     MPFLT66
6D7D 7E6D83      2036          JMP      L21T
                2037
6D80 7E7915      2038 MPFLT66    JMP      MPFLT
                2039
                2040
                2041
                2042 ;          TESTING AND INSTRUCTION
                2043
                2044 ;          TESTING ANDA
                2045
6D83 CC55AA      2046 L21T        LDD      #$55AA
6D86 D710        2047          STAB     TEMP
6D88 9410        2048          ANDA     TEMP
6D8A 8100        2049          CMPA     #$00
6D8C 2624        2050          BNE     MPFLT67
                2051
                2052
6D8E CC5555      2053          LDD      #$5555
6D91 D710        2054          STAB     TEMP
6D93 9410        2055          ANDA     TEMP
6D95 8155        2056          CMPA     #$55
6D97 2619        2057          BNE     MPFLT67
                2058
                2059
6D99 CCFF55      2060          LDD      #$FF55
6D9C D710        2061          STAB     TEMP
6D9E 9410        2062          ANDA     TEMP
6DA0 8155        2063          CMPA     #$55
6DA2 260E        2064          BNE     MPFLT67
                2065
6DA4 CCFFAA      2066          LDD      #$FFAA
6DA7 D710        2067          STAB     TEMP
6DA9 9410        2068          ANDA     TEMP
6DAB 81AA        2069          CMPA     #$AA
6DAD 2603        2070          BNE     MPFLT67
6DAF 7E6DB5      2071          JMP      L21U
                2072
6DB2 7E7915      2073 MPFLT67    JMP      MPFLT
                2074
                2075 ;          TESTING ANDB
                2076
6DB5 CC55AA      2077 L21U        LDD      #$55AA
6DB8 9710        2078          STAA     TEMP
6DBA D410        2079          ANDB     TEMP
6DBC C100        2080          CMPB     #$00
6DBE 2624        2081          BNE     MPFLT68
                2082
                2083
6DC0 CC5555      2084          LDD      #$5555
6DC3 9710        2085          STAA     TEMP
6DC5 D410        2086          ANDB     TEMP
6DC7 C155        2087          CMPB     #$55
6DC9 2619        2088          BNE     MPFLT68

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2089
2090
6DCB CCFF55 2091      LDD      $$FF55
6DCE 9710    2092      STAA     TEMP
6DD0 D410    2093      ANDB     TEMP
6DD2 C155    2094      CMPB     $$55
6DD4 260E    2095      BNE      MPFLT68
2096
6DD6 CCFFAA 2097      LDD      $$FFAA
6DD9 9710    2098      STAA     TEMP
6DDB D410    2099      ANDB     TEMP
6DDD C1AA    2100      CMPB     $$AA
6DDF 2603    2101      BNE      MPFLT68
6DE1 7E6DE7 2102      JMP      L21W
2103
6DE4 7E7915 2104      MPFLT68  JMP      MPFLT
2105
2106
2107 ;          TESTING ORAB
2108
6DE7 CC55AA 2109      L21W    LDD      $$55AA
6DEA 9710    2110      STAA     TEMP
6DEC DA10    2111      ORAB     TEMP
6DEE C1FF    2112      CMPB     $$FF
6DF0 2624    2113      BNE      MPFLT70
2114
2115
6DF2 CC5555 2116      LDD      $$5555
6DF5 9710    2117      STAA     TEMP
6DF7 DA10    2118      ORAB     TEMP
6DF9 C155    2119      CMPB     $$55
6DFB 2619    2120      BNE      MPFLT70
2121
2122
6DFD CC0055 2123      LDD      $$0055
6E00 9710    2124      STAA     TEMP
6E02 DA10    2125      ORAB     TEMP
6E04 C155    2126      CMPB     $$55
6E06 260E    2127      BNE      MPFLT70
2128
2129
6E08 CC00AA 2130      LDD      $$00AA
6E0B 9710    2131      STAA     TEMP
6E0D DA10    2132      ORAB     TEMP
6E0F C1AA    2133      CMPB     $$AA
6E11 2603    2134      BNE      MPFLT70
6E13 7E6E19 2135      JMP      L21X
2136
6E16 7E7915 2137      MPFLT70  JMP      MPFLT
2138
2139 ;          TESTING EXCLUSIVE OR INSTRUCTIONS
2140
2141 ;          TESTING EORA
2142
6E19 CC55AA 2143      L21X    LDD      $$55AA
6E1C D710    2144      STAB     TEMP
6E1E 9810    2145      EORA     TEMP
6E20 81FF    2146      CMPA     $$FF

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6E22 2624      2147      BNE      MPFLT71
                2148
                2149
6E24 CC5555    2150      LDD      #$5555
6E27 D710      2151      STAB     TEMP
6E29 9810      2152      EORA     TEMP
6E2B 8100      2153      CMPA     #$00
6E2D 2619      2154      BNE      MPFLT71
                2155
                2156
6E2F CC0055    2157      LDD      #$0055
6E32 D710      2158      STAB     TEMP
6E34 9810      2159      EORA     TEMP
6E36 8155      2160      CMPA     #$55
6E38 260E      2161      BNE      MPFLT71
                2162
                2163
6E3A CCFFAA    2164      LDD      #$FFAA
6E3D D710      2165      STAB     TEMP
6E3F 9810      2166      EORA     TEMP
6E41 8155      2167      CMPA     #$55
6E43 2603      2168      BNE      MPFLT71
6E45 7E6E4B    2169      JMP      L21Y
                2170
6E48 7E7915    2171      MPFLT71 JMP      MPFLT
                2172
                2173 ;      TESTING EORB
                2174
6E4B CC55AA    2175      L21Y    LDD      #$55AA
6E4E 9710      2176      STAA     TEMP
6E50 D810      2177      EORB     TEMP
6E52 C1FF      2178      CMPB     #$FF
6E54 2624      2179      BNE      MPFLT72
                2180
                2181
6E56 CC5555    2182      LDD      #$5555
6E59 9710      2183      STAA     TEMP
6E5B D810      2184      EORB     TEMP
6E5D C100      2185      CMPB     #$00
6E5F 2619      2186      BNE      MPFLT72
                2187
                2188
6E61 CC0055    2189      LDD      #$0055
6E64 9710      2190      STAA     TEMP
6E66 D810      2191      EORB     TEMP
6E68 C155      2192      CMPB     #$55
6E6A 260E      2193      BNE      MPFLT72
                2194
                2195
6E6C CCFFAA    2196      LDD      #$FFAA
6E6F 9710      2197      STAA     TEMP
6E71 D810      2198      EORB     TEMP
6E73 C155      2199      CMPB     #$55
6E75 2603      2200      BNE      MPFLT72
6E77 7E6E7D    2201      JMP      L21Z
                2202
6E7A 7E7915    2203      MPFLT72 JMP      MPFLT
                2204

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2205 ;          TESTING ONE'S COMPLEMENT INSTRUCTIONS
2206
2207
2208 ;          TESTING COMA
2209
6E7D 8600      2210 L21Z      LDAA    #$00
6E7F 43        2211          COMA
6E80 81FF      2212          CMPA    #$FF
6E82 2618      2213          BNE     MPFLT73
2214
6E84 86FF      2215          LDAA    #$FF
6E86 43        2216          COMA
6E87 8100      2217          CMPA    #$00
6E89 2611      2218          BNE     MPFLT73
2219
6E8B 8655      2220          LDAA    #$55
6E8D 43        2221          COMA
6E8E 81AA      2222          CMPA    #$AA
6E90 260A      2223          BNE     MPFLT73
2224
6E92 86AA      2225          LDAA    #$AA
6E94 43        2226          COMA
6E95 8155      2227          CMPA    #$55
6E97 2603      2228          BNE     MPFLT73
6E99 7E6E9F    2229          JMP     L22A
2230
6E9C 7E7915    2231 MPFLT73    JMP     MPFLT
2232
2233 ;          TESTING COMB
2234
6E9F C600      2235 L22A      LDAB    #$00
6EA1 53        2236          COMB
6EA2 C1FF      2237          CMPB    #$FF
6EA4 2618      2238          BNE     MPFLT74
2239
2240
6EA6 C6FF      2241          LDAB    #$FF
6EA8 53        2242          COMB
6EA9 C100      2243          CMPB    #$00
6EAB 2611      2244          BNE     MPFLT74
2245
6EAD C655      2246          LDAB    #$55
6EAF 53        2247          COMB
6EB0 C1AA      2248          CMPB    #$AA
6EB2 260A      2249          BNE     MPFLT74
2250
6EB4 C6AA      2251          LDAB    #$AA
6EB6 53        2252          COMB
6EB7 C155      2253          CMPB    #$55
6EB9 2603      2254          BNE     MPFLT74
6EBB 7E6EC1    2255          JMP     L22B
2256
6EBE 7E7915    2257 MPFLT74    JMP     MPFLT
2258
2259
2260 ;          TESTING COM
2261
6EC1 8600      2262 L22B      LDAA    #$00

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6EC3 9710      2263          STAA    TEMP
6EC5 730010    2264          COM     TEMP
6EC8 9610      2265          LDAA   TEMP
6ECA 81FF      2266          CMPA   #$FF
6ECC 262A      2267          BNE    MPFLT75
                2268
                2269
                2270
6ECE 86FF      2271          LDAA   #$FF
6ED0 9710      2272          STAA   TEMP
6ED2 730010    2273          COM     TEMP
6ED5 9610      2274          LDAA   TEMP
6ED7 8100      2275          CMPA   #$00
6ED9 261D      2276          BNE    MPFLT75
                2277
6EDB 8655      2278          LDAA   #$55
6EDD 9710      2279          STAA   TEMP
6EDF 730010    2280          COM     TEMP
6EE2 9610      2281          LDAA   TEMP
6EE4 81AA      2282          CMPA   #$AA
6EE6 2610      2283          BNE    MPFLT75
                2284
6EE8 86AA      2285          LDAA   #$AA
6EEA 9710      2286          STAA   TEMP
6EEC 730010    2287          COM     TEMP
6EEF 9610      2288          LDAA   TEMP
6EF1 8155      2289          CMPA   #$55
6EF3 2603      2290          BNE    MPFLT75
6EF5 7E6EFB    2291          JMP    L22C
                2292
6EF8 7E7915    2293 MPFLT75    JMP    MPFLT
                2294
                2295
                2296 ;          TESTING TWO'S COMPLEMENT INSTRUCTIONS
                2297
                2298 ;          TESTING NEGA
                2299
6EFB 86FF      2300 L22C      LDAA   #$FF
6EFD 40         2301          NEGA
6EFE 8101      2302          CMPA   #$01
6F00 2618      2303          BNE    MPFLT76
                2304
6F02 8600      2305 LOC34     LDAA   #$00
6F04 40         2306          NEGA
6F05 8100      2307          CMPA   #$00
6F07 2611      2308          BNE    MPFLT76
                2309
                2310
6F09 8655      2311          LDAA   #$55
6F0B 40         2312          NEGA
6F0C 81AB      2313          CMPA   #$AB
6F0E 260A      2314          BNE    MPFLT76
                2315
6F10 86AA      2316 LOC35     LDAA   #$AA
6F12 40         2317          NEGA
6F13 8156      2318          CMPA   #$56
6F15 2603      2319          BNE    MPFLT76
6F17 7E6F1D    2320          JMP    LC35A

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2321
6F1A 7E7915 2322 MPFLT76 JMP MPFLT
2323
2324
2325 ; TESTING NEGB
2326
6F1D C6FF 2327 LC35A LDAB #$FF
6F1F 50 2328 NEGB
6F20 C101 2329 CMPB #$01
6F22 2618 2330 BNE MPFLT77
2331
6F24 C600 2332 LC35B LDAB #$00
6F26 50 2333 NEGB
6F27 C100 2334 CMPB #$00
6F29 2611 2335 BNE MPFLT77
2336
2337
6F2B C655 2338 LDAB #$55
6F2D 50 2339 NEGB
6F2E C1AB 2340 CMPB #$AB
6F30 260A 2341 BNE MPFLT77
2342
6F32 C6AA 2343 LC35C LDAB #$AA
6F34 50 2344 NEGB
6F35 C156 2345 CMPB #$56
6F37 2603 2346 BNE MPFLT77
6F39 7E6F3F 2347 JMP LOC36
2348
6F3C 7E7915 2349 MPFLT77 JMP MPFLT
2350
2351 ; TESTING NEG
2352
6F3F 86FF 2353 LOC36 LDAA #$FF
6F41 9710 2354 STAA TEMP
6F43 700010 2355 NEG TEMP
6F46 9610 2356 LDAA TEMP
6F48 8101 2357 CMPA #$01
6F4A 262A 2358 BNE MPFLT78
2359
6F4C 8600 2360 LDAA #$00
6F4E 9710 2361 STAA TEMP
6F50 700010 2362 NEG TEMP
6F53 9610 2363 LDAA TEMP
6F55 8100 2364 CMPA #$00
6F57 261D 2365 BNE MPFLT78
2366
6F59 8655 2367 LDAA #$55
6F5B 9710 2368 STAA TEMP
6F5D 700010 2369 NEG TEMP
6F60 9610 2370 LDAA TEMP
6F62 81AB 2371 CMPA #$AB
6F64 2610 2372 BNE MPFLT78
2373
6F66 86AA 2374 LDAA #$AA
6F68 9710 2375 STAA TEMP
6F6A 700010 2376 NEG TEMP
6F6D 9610 2377 LDAA TEMP
6F6F 8156 2378 CMPA #$56

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6F71 2603      2379          BNE      MPFLT78
6F73 7E6F79   2380          JMP      L22D
                2381
6F76 7E7915   2382 MPFLT78   JMP      MPFLT
                2383
                2384
                2385 ;          TESTING ARITHMETIC SHIFT LEFT INSTRUCTIONS
                2386
                2387 ;          TESTING ASLA
                2388
6F79 0C       2389 L22D        CLC
6F7A 86AA     2390          LDAA     $$AA
6F7C 48       2391          ASLA
6F7D 2431     2392          BHS     MPFLT79
6F7F 8154     2393          CMPA     $$54
6F81 262D     2394          BNE     MPFLT79
6F83 48       2395 LOC37      ASLA
6F84 252A     2396          BCS     MPFLT79
6F86 81A8     2397          CMPA     $$A8
6F88 2626     2398          BNE     MPFLT79
6F8A 48       2399          ASLA
6F8B 2423     2400          BHS     MPFLT79
6F8D 8150     2401          CMPA     $$50
6F8F 261F     2402          BNE     MPFLT79
6F91 48       2403 LOC38      ASLA
6F92 251C     2404          BCS     MPFLT79
6F94 81A0     2405          CMPA     $$A0
6F96 2618     2406          BNE     MPFLT79
6F98 48       2407          ASLA
6F99 2415     2408          BHS     MPFLT79
6F9B 8140     2409          CMPA     $$40
6F9D 2611     2410          BNE     MPFLT79
6F9F 48       2411 LOC39      ASLA
6FA0 250E     2412          BCS     MPFLT79
6FA2 8180     2413          CMPA     $$80
6FA4 260A     2414          BNE     MPFLT79
6FA6 48       2415          ASLA
6FA7 2407     2416          BHS     MPFLT79
6FA9 8100     2417          CMPA     $$00
6FAB 2603     2418          BNE     MPFLT79
6FAD 7E6FB3   2419          JMP      LOC40
                2420
6FB0 7E7915   2421 MPFLT79   JMP      MPFLT
                2422
                2423 ;          TESTING ASLB
                2424
6FB3 0C       2425 LOC40      CLC
6FB4 C6AA     2426          LDAB     $$AA
6FB6 58       2427          ASLB
6FB7 2431     2428          BHS     MPFLT80
6FB9 C154     2429          CMPB     $$54
6FBB 262D     2430          BNE     MPFLT80
6FBD 58       2431 LC40A     ASLB
6FBE 252A     2432          BCS     MPFLT80
6FC0 C1A8     2433          CMPB     $$A8
6FC2 2626     2434          BNE     MPFLT80
6FC4 58       2435          ASLB

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6FC5 2423      2436      BHS      MPFLT80
6FC7 C150      2437      CMPB     $$50
6FC9 261F      2438      BNE      MPFLT80
6FCB 58        2439      LC40B    ASLB
6FCC 251C      2440      BCS      MPFLT80
6FCE C1A0      2441      CMPB     $$A0
6FD0 2618      2442      BNE      MPFLT80
6FD2 58        2443      ASLB
6FD3 2415      2444      BHS      MPFLT80
6FD5 C140      2445      CMPB     $$40
6FD7 2611      2446      BNE      MPFLT80
6FD9 58        2447      LC40C    ASLB
6FDA 250E      2448      BCS      MPFLT80
6FDC C180      2449      CMPB     $$80
6FDE 260A      2450      BNE      MPFLT80
6FE0 58        2451      ASLB
6FE1 2407      2452      BHS      MPFLT80
6FE3 C100      2453      CMPB     $$00
6FE5 2603      2454      BNE      MPFLT80
6FE7 7E6FED    2455      JMP      LC40D
                2456
6FEA 7E7915    2457      MPFLT80  JMP      MPFLT
                2458
                2459      ;        TESTING ASL
                2460
6FED 86AA      2461      LC40D    LDAA     $$AA
6FEF 9710      2462      STAA     TEMP
6FF1 780010    2463      ASL      TEMP
6FF4 9610      2464      LDAA     TEMP
6FF6 8154      2465      CMPA     $$54
6FF8 2639      2466      BNE      MPFLT81
                2467
6FFA 780010    2468      ASL      TEMP
6FFD 9610      2469      LDAA     TEMP
6FFF 81A8      2470      CMPA     $$A8
7001 2630      2471      BNE      MPFLT81
                2472
7003 780010    2473      ASL      TEMP
7006 9610      2474      LDAA     TEMP
7008 8150      2475      CMPA     $$50
700A 2627      2476      BNE      MPFLT81
                2477
700C 780010    2478      ASL      TEMP
700F 9610      2479      LDAA     TEMP
7011 81A0      2480      CMPA     $$A0
7013 261E      2481      BNE      MPFLT81
                2482
7015 780010    2483      ASL      TEMP
7018 9610      2484      LDAA     TEMP
701A 8140      2485      CMPA     $$40
701C 2615      2486      BNE      MPFLT81
                2487
701E 780010    2488      ASL      TEMP
7021 9610      2489      LDAA     TEMP
7023 8180      2490      CMPA     $$80
7025 260C      2491      BNE      MPFLT81
                2492
7027 780010    2493      ASL      TEMP

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702A 9610      2494      LDAA    TEMP
702C 8100      2495      CMPA    #$00
702E 2603      2496      BNE     MPFLT81
7030 7E7036    2497      JMP     L22E
              2498
7033 7E7915    2499  MPFLT81  JMP     MPFLT
              2500
              2501 ;          TESTING ASLD
              2502
7036 CCAAAA    2503  L22E    LDD     #$AAAA
7039 05        2504      ASLD
703A 1A835554  2505      CPD     #$5554
703E 262D      2506      BNE     MPFLT82
              2507
7040 05        2508      ASLD
7041 1A83AAA8  2509      CPD     #$AAA8
7045 2626      2510      BNE     MPFLT82
              2511
7047 05        2512      ASLD
7048 1A835550  2513      CPD     #$5550
704C 261F      2514      BNE     MPFLT82
              2515
704E 05        2516      ASLD
704F 1A83AAA0  2517      CPD     #$AAA0
7053 2618      2518      BNE     MPFLT82
              2519
7055 05        2520      ASLD
7056 1A835540  2521      CPD     #$5540
705A 2611      2522      BNE     MPFLT82
              2523
705C 05        2524      ASLD
705D 1A83AA80  2525      CPD     #$AA80
7061 260A      2526      BNE     MPFLT82
              2527
7063 05        2528      ASLD
7064 1A835500  2529      CPD     #$5500
7068 2603      2530      BNE     MPFLT82
706A 7E7070    2531      JMP     L22F
              2532
706D 7E7915    2533  MPFLT82  JMP     MPFLT
              2534
              2535
              2536 ;          TESTING ARITHMETIC SHIFT RIGHT INSTRUCTION
              2537
              2538 ;          TESTING ASRA
              2539
7070 0C        2540  L22F    CLC
7071 86AA      2541      LDAA    #$AA
7073 47        2542      ASRA
7074 2531      2543      BCS     MPFLT83
7076 81D5      2544      CMPA    #$D5
7078 262D      2545      BNE     MPFLT83
707A 47        2546      ASRA
707B 242A      2547      BHS     MPFLT83
707D 81EA      2548      CMPA    #$EA
707F 2626      2549      BNE     MPFLT83
7081 47        2550  LOC41   ASRA

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7082 2523      2551      BCS      MPFLT83
7084 81F5      2552      CMPA     #$F5
7086 261F      2553      BNE      MPFLT83
7088 47         2554      ASRA
7089 241C      2555      BHS      MPFLT83
708B 81FA      2556      CMPA     #$FA
708D 2618      2557      BNE      MPFLT83
708F 47         2558      ASRA
7090 2515      2559      BCS      MPFLT83
7092 81FD      2560      CMPA     #$FD
7094 2611      2561      BNE      MPFLT83
7096 47         2562      ASRA
7097 240E      2563      BHS      MPFLT83
7099 81FE      2564      CMPA     #$FE
709B 260A      2565      BNE      MPFLT83
709D 47         2566      ASRA
709E 2507      2567      BCS      MPFLT83
70A0 81FF      2568      CMPA     #$FF
70A2 2603      2569      BNE      MPFLT83
70A4 7E70AA    2570      JMP      L22G
              2571
70A7 7E7915    2572      MPFLT83  JMP      MPFLT
              2573
              2574
              2575      ;          TESTING ASRB
              2576
70AA 0C         2577      L22G     CLC
70AB C6AA      2578      LDAB     #$AA
70AD 57         2579      ASRB
70AE 2531      2580      BCS      MPFLT84
70B0 C1D5      2581      CMPB     #$D5
70B2 262D      2582      BNE      MPFLT84
70B4 57         2583      ASRB
70B5 242A      2584      BHS      MPFLT84
70B7 C1EA      2585      CMPB     #$EA
70B9 2626      2586      BNE      MPFLT84
70BB 57         2587      ASRB
70BC 2523      2588      BCS      MPFLT84
70BE C1F5      2589      CMPB     #$F5
70C0 261F      2590      BNE      MPFLT84
70C2 57         2591      ASRB
70C3 241C      2592      BHS      MPFLT84
70C5 C1FA      2593      CMPB     #$FA
70C7 2618      2594      BNE      MPFLT84
70C9 57         2595      ASRB
70CA 2515      2596      BCS      MPFLT84
70CC C1FD      2597      CMPB     #$FD
70CE 2611      2598      BNE      MPFLT84
70D0 57         2599      ASRB
70D1 240E      2600      BHS      MPFLT84
70D3 C1FE      2601      CMPB     #$FE
70D5 260A      2602      BNE      MPFLT84
70D7 57         2603      ASRB
70D8 2507      2604      BCS      MPFLT84
70DA C1FF      2605      CMPB     #$FF
70DC 2603      2606      BNE      MPFLT84
70DE 7E70E4    2607      JMP      L22H
              2608

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70E1 7E7915 2609 MPFLT84 JMP MPFLT
          2610
          2611
          2612
          2613 ; TESTING ASR
          2614
70E4 86AA 2615 L22H LDAA $$AA
70E6 9710 2616 STAA TEMP
70E8 770010 2617 ASR TEMP
70EB 9610 2618 LDAA TEMP
70ED 81D5 2619 CMPA #$D5
70EF 2630 2620 BNE MPFLT85
          2621
70F1 770010 2622 ASR TEMP
70F4 9610 2623 LDAA TEMP
70F6 81EA 2624 CMPA $$EA
70F8 2627 2625 BNE MPFLT85
          2626
70FA 770010 2627 ASR TEMP
70FD 9610 2628 LDAA TEMP
70FF 81F5 2629 CMPA #$F5
7101 261E 2630 BNE MPFLT85
          2631
7103 770010 2632 ASR TEMP
7106 9610 2633 LDAA TEMP
7108 81FA 2634 CMPA $$FA
710A 2615 2635 BNE MPFLT85
          2636
710C 770010 2637 ASR TEMP
710F 9610 2638 LDAA TEMP
7111 81FD 2639 CMPA $$FD
7113 260C 2640 BNE MPFLT85
          2641
7115 770010 2642 ASR TEMP
7118 9610 2643 LDAA TEMP
711A 81FE 2644 CMPA $$FE
711C 2603 2645 BNE MPFLT85
711E 7E7124 2646 JMP L22J
          2647
7121 7E7915 2648 MPFLT85 JMP MPFLT
          2649
          2650
          2651 ; TESTING LOGICAL SHIFT RIGHT INSTRUCTION
          2652
          2653 ; TESTING LSRA
          2654
7124 0C 2655 L22J CLC
7125 86AA 2656 LDAA $$AA
7127 44 2657 LSRA
7128 2538 2658 BCS MPFLT86
712A 8155 2659 CMPA $$55
712C 2634 2660 BNE MPFLT86
712E 44 2661 LSRA
712F 2431 2662 BHS MPFLT86
7131 812A 2663 CMPA $$2A
7133 262D 2664 BNE MPFLT86
7135 44 2665 LOC44 LSRA
7136 252A 2666 BCS MPFLT86

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7138 8115      2667      CMPA    #$15
713A 2626      2668      BNE     MPFLT86
713C 44        2669      LSRA   MPFLT86
713D 2423      2670      BHS    MPFLT86
713F 810A      2671      CMPA   #$0A
7141 261F      2672      BNE     MPFLT86
7143 44        2673      LOC45  LSRA   MPFLT86
7144 251C      2674      BCS    MPFLT86
7146 8105      2675      CMPA   #$05
7148 2618      2676      BNE     MPFLT86
714A 44        2677      LSRA   MPFLT86
714B 2415      2678      BHS    MPFLT86
714D 8102      2679      CMPA   #$02
714F 2611      2680      BNE     MPFLT86
7151 44        2681      LOC46  LSRA   MPFLT86
7152 250E      2682      BCS    MPFLT86
7154 8101      2683      CMPA   #$01
7156 260A      2684      BNE     MPFLT86
7158 44        2685      LSRA   MPFLT86
7159 2407      2686      BHS    MPFLT86
715B 8100      2687      CMPA   #$00
715D 2603      2688      BNE     MPFLT86
715F 7E7165    2689      JMP     LOC47
                2690
7162 7E7915    2691      MPFLT86 JMP    MPFLT
                2692
                2693
                2694 ;      TESTING LSRB
                2695
7165 0C        2696      LOC47  CLC
7166 C6AA      2697      LDAB   #$AA
7168 54        2698      LSRB
7169 2538      2699      BCS    MPFLT87
716B C155      2700      CMPB   #$55
716D 2634      2701      BNE     MPFLT87
716F 54        2702      LSRB
7170 2431      2703      BHS    MPFLT87
7172 C12A      2704      CMPB   #$2A
7174 262D      2705      BNE     MPFLT87
7176 54        2706      LC47A  LSRB
7177 252A      2707      BCS    MPFLT87
7179 C115      2708      CMPB   #$15
717B 2626      2709      BNE     MPFLT87
717D 54        2710      LSRB
717E 2423      2711      BHS    MPFLT87
7180 C10A      2712      CMPB   #$0A
7182 261F      2713      BNE     MPFLT87
7184 54        2714      LC47B  LSRB
7185 251C      2715      BCS    MPFLT87
7187 C105      2716      CMPB   #$05
7189 2618      2717      BNE     MPFLT87
718B 54        2718      LSRB
718C 2415      2719      BHS    MPFLT87
718E C102      2720      CMPB   #$02
7190 2611      2721      BNE     MPFLT87
7192 54        2722      LC47C  LSRB
7193 250E      2723      BCS    MPFLT87
7195 C101      2724      CMPB   #$01

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7197 260A      2725          BNE      MPFLT87
7199 54        2726          LSRB
719A 2407      2727          BHS      MPFLT87
719C C100      2728          CMPB     #$00
719E 2603      2729          BNE      MPFLT87
71A0 7E71A6    2730          JMP      LC47D
              2731
71A3 7E7915    2732 MPFLT87    JMP      MPFLT
              2733
              2734 ;          TESTING LSRD
              2735
71A6 0C        2736 LC47D      CLC
71A7 CCAAAA    2737          LDD      #$AAAA
71AA 04        2738          LSRD
71AB 1A835555  2739          CPD      #$5555
71AF 262D      2740          BNE      MPFLT88
              2741
71B1 04        2742          LSRD
71B2 1A832AAA  2743          CPD      #$2AAA
71B6 2626      2744          BNE      MPFLT88
              2745
71B8 04        2746          LSRD
71B9 1A831555  2747          CPD      #$1555
71BD 261F      2748          BNE      MPFLT88
              2749
71BF 04        2750          LSRD
71C0 1A830AAA  2751          CPD      #$0AAA
71C4 2618      2752          BNE      MPFLT88
              2753
71C6 04        2754          LSRD
71C7 1A830555  2755          CPD      #$0555
71CB 2611      2756          BNE      MPFLT88
              2757
71CD 04        2758          LSRD
71CE 1A8302AA  2759          CPD      #$02AA
71D2 260A      2760          BNE      MPFLT88
              2761
71D4 04        2762          LSRD
71D5 1A830155  2763          CPD      #$0155
71D9 2603      2764          BNE      MPFLT88
71DB 7E71E1    2765          JMP      L22K
              2766
71DE 7E7915    2767 MPFLT88    JMP      MPFLT
              2768
              2769 ;          TESTING LSR
              2770
71E1 0C        2771 L22K      CLC
71E2 86AA      2772          LDAA     #$AA
71E4 9710      2773          STAA     TEMP
71E6 740010    2774          LSR      TEMP
71E9 9610      2775          LDAA     TEMP
71EB 8155      2776          CMPA     #$55
71ED 2642      2777          BNE      MPFLT89
              2778
71EF 740010    2779          LSR      TEMP
71F2 9610      2780          LDAA     TEMP
71F4 812A      2781          CMPA     #$2A
71F6 2639      2782          BNE      MPFLT89

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2783
71F8 740010 2784      LSR      TEMP
71FB 9610    2785      LDAA     TEMP
71FD 8115    2786      CMPA     #$15
71FF 2630    2787      BNE      MPFLT89
2788
7201 740010 2789      LSR      TEMP
7204 9610    2790      LDAA     TEMP
7206 810A    2791      CMPA     #$0A
7208 2627    2792      BNE      MPFLT89
2793
720A 740010 2794      LSR      TEMP
720D 9610    2795      LDAA     TEMP
720F 8105    2796      CMPA     #$05
7211 261E    2797      BNE      MPFLT89
2798
7213 740010 2799      LSR      TEMP
7216 9610    2800      LDAA     TEMP
7218 8102    2801      CMPA     #$02
721A 2615    2802      BNE      MPFLT89
2803
721C 740010 2804      LSR      TEMP
721F 9610    2805      LDAA     TEMP
7221 8101    2806      CMPA     #$01
7223 260C    2807      BNE      MPFLT89
2808
7225 740010 2809      LSR      TEMP
7228 9610    2810      LDAA     TEMP
722A 8100    2811      CMPA     #$00
722C 2603    2812      BNE      MPFLT89
722E 7E7234 2813      JMP      L22L
2814
7231 7E7915 2815      MPFLT89 JMP      MPFLT
2816
2817 ;          TESTING ROTATE RIGHT INSTRUCTION
2818
2819 ;          TESTING RORA
7234 0C      2820      L22L    CLC
7235 86AA    2821      LDAA     #$AA
7237 46      2822      RORA
7238 2538    2823      BCS      MPFLT90
723A 8155    2824      CMPA     #$55
723C 2634    2825      BNE      MPFLT90
2826
723E 46      2827      RORA
723F 2431    2828      BHS      MPFLT90
7241 812A    2829      CMPA     #$2A
7243 262D    2830      BNE      MPFLT90
7245 46      2831      LOC48  RORA
7246 252A    2832      BCS      MPFLT90
7248 8115    2833      CMPA     #$15
724A 2626    2834      BNE      MPFLT90
724C 46      2835      RORA
724D 2423    2836      BHS      MPFLT90
724F 810A    2837      CMPA     #$0A
7251 261F    2838      BNE      MPFLT90
7253 46      2839      LOC49  RORA
7254 8105    2840      CMPA     #$05

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7256 261A      2841          BNE      MPFLT90
7258 2518      2842          BCS      MPFLT90
725A 46        2843          RORA
725B 2415      2844          BHS      MPFLT90
725D 8102      2845          CMPA     #$02
725F 2611      2846          BNE      MPFLT90
7261 46        2847  LOC50    RORA
7262 250E      2848          BCS      MPFLT90
7264 8101      2849          CMPA     #$01
7266 260A      2850          BNE      MPFLT90
7268 46        2851          RORA
7269 2407      2852          BHS      MPFLT90
726B 8100      2853          CMPA     #$00
726D 2603      2854          BNE      MPFLT90
726F 7E7275    2855          JMP      LC50A
                2856
7272 7E7915    2857  MPFLT90  JMP      MPFLT
                2858
                2859 ;          TESTING RORB
                2860
7275 0C        2861  LC50A      CLC
7276 C6AA      2862          LDAB     #$AA
7278 56        2863          RORB
7279 2538      2864          BCS      MPFLT91
727B C155      2865          CMPB     #$55
727D 2634      2866          BNE      MPFLT91
727F 56        2867          RORB
7280 2431      2868          BHS      MPFLT91
7282 C12A      2869          CMPB     #$2A
7284 262D      2870          BNE      MPFLT91
7286 56        2871  LC50B      RORB
7287 252A      2872          BCS      MPFLT91
7289 C115      2873          CMPB     #$15
728B 2626      2874          BNE      MPFLT91
728D 56        2875          RORB
728E 2423      2876          BHS      MPFLT91
7290 C10A      2877          CMPB     #$0A
7292 261F      2878          BNE      MPFLT91
7294 56        2879  LC50C      RORB
7295 251C      2880          BCS      MPFLT91
7297 C105      2881          CMPB     #$05
7299 2618      2882          BNE      MPFLT91
729B 56        2883          RORB
729C 2415      2884          BHS      MPFLT91
729E C102      2885          CMPB     #$02
72A0 2611      2886          BNE      MPFLT91
72A2 56        2887  LC50D      RORB
72A3 250E      2888          BCS      MPFLT91
72A5 C101      2889          CMPB     #$01
72A7 260A      2890          BNE      MPFLT91
72A9 56        2891          RORB
72AA 2407      2892          BHS      MPFLT91
72AC C100      2893          CMPB     #$00
72AE 2603      2894          BNE      MPFLT91
72B0 7E72B6    2895          JMP      LC50E
                2896
72B3 7E7915    2897  MPFLT91  JMP      MPFLT
                2898

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2899 ;          TESTING ROR
2900
72B6 0C        2901 LC50E    CLC
72B7 86AA     2902          LDAA    #$AA
72B9 9710     2903          STAA    TEMP
72BB 760010   2904          ROR     TEMP
72BE 9610     2905          LDAA    TEMP
72C0 8155     2906          CMPA   #$55
72C2 2642     2907          BNE    MPFLT92
2908
72C4 760010   2909          ROR     TEMP
72C7 9610     2910          LDAA    TEMP
72C9 812A     2911          CMPA   #$2A
72CB 2639     2912          BNE    MPFLT92
2913
72CD 760010   2914          ROR     TEMP
72D0 9610     2915          LDAA    TEMP
72D2 8115     2916          CMPA   #$15
72D4 2630     2917          BNE    MPFLT92
2918
72D6 760010   2919          ROR     TEMP
72D9 9610     2920          LDAA    TEMP
72DB 810A     2921          CMPA   #$0A
72DD 2627     2922          BNE    MPFLT92
2923
72DF 760010   2924          ROR     TEMP
72E2 9610     2925          LDAA    TEMP
72E4 8105     2926          CMPA   #$05
72E6 261E     2927          BNE    MPFLT92
2928
72E8 760010   2929          ROR     TEMP
72EB 9610     2930          LDAA    TEMP
72ED 8102     2931          CMPA   #$02
72EF 2615     2932          BNE    MPFLT92
2933
72F1 760010   2934          ROR     TEMP
72F4 9610     2935          LDAA    TEMP
72F6 8101     2936          CMPA   #$01
72F8 260C     2937          BNE    MPFLT92
2938
72FA 760010   2939          ROR     TEMP
72FD 9610     2940          LDAA    TEMP
72FF 8100     2941          CMPA   #$00
7301 2603     2942          BNE    MPFLT92
7303 7E7309   2943          JMP     LOC51
2944
7306 7E7915   2945 MPFLT92   JMP     MPFLT
2946
2947
2948 ;          TESTING ROTATE LEFT INSTRUCTION
2949
2950 ;          TESTING ROLA
2951
7309 0C        2952 LOC51    CLC
730A 86AA     2953          LDAA    #$AA
730C 49        2954          ROLA
730D 2438     2955          BHS    MPFLT93
730F 8154     2956          CMPA   #$54

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7311 2634      2957          BNE      MPFLT93
7313 49        2958 LOC52     ROLA
7314 2531      2959          BCS      MPFLT93
7316 81A8      2960          CMPA     $$A8
7318 262D      2961          BNE      MPFLT93
731A 49        2962          ROLA
731B 242A      2963          BHS      MPFLT93
731D 8150      2964          CMPA     $50
731F 2626      2965          BNE      MPFLT93
7321 49        2966 LOC53     ROLA
7322 2523      2967          BCS      MPFLT93
7324 81A0      2968          CMPA     $A0
7326 261F      2969          BNE      MPFLT93
7328 49        2970          ROLA
7329 241C      2971          BHS      MPFLT93
732B 8140      2972          CMPA     $40
732D 2618      2973          BNE      MPFLT93
732F 49        2974 LOC54     ROLA
7330 2515      2975          BCS      MPFLT93
7332 8180      2976          CMPA     $80
7334 2611      2977          BNE      MPFLT93
7336 49        2978          ROLA
7337 240E      2979          BHS      MPFLT93
7339 8100      2980          CMPA     $00
733B 260A      2981          BNE      MPFLT93
733D 49        2982 LOC55     ROLA
733E 2507      2983          BCS      MPFLT93
7340 8100      2984          CMPA     $00
7342 2603      2985          BNE      MPFLT93
7344 7E734A    2986          JMP      L22M
              2987
7347 7E7915    2988 MPFLT93    JMP      MPFLT
              2989
              2990 ;          TESTING ROLB
              2991
734A 0C        2992 L22M      CLC
734B C6AA      2993          LDAB     $$AA
734D 59        2994          ROLB
734E 2438      2995          BHS      MPFLT94
7350 C154      2996          CMPB     $54
7352 2634      2997          BNE      MPFLT94
7354 59        2998 LC55A     ROLB
7355 2531      2999          BCS      MPFLT94
7357 C1A8      3000          CMPB     $A8
7359 262D      3001          BNE      MPFLT94
735B 59        3002          ROLB
735C 242A      3003          BHS      MPFLT94
735E C150      3004          CMPB     $50
7360 2626      3005          BNE      MPFLT94
7362 59        3006 LC55B     ROLB
7363 2523      3007          BCS      MPFLT94
7365 C1A0      3008          CMPB     $A0
7367 261F      3009          BNE      MPFLT94
7369 59        3010          ROLB
736A 241C      3011          BHS      MPFLT94
736C C140      3012          CMPB     $40
736E 2618      3013          BNE      MPFLT94
7370 59        3014 LC55C     ROLB

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7371 2515      3015      BCS      MPFLT94
7373 C180      3016      CMPB     #$80
7375 2611      3017      BNE      MPFLT94
7377 59        3018      ROLB
7378 240E      3019      BHS      MPFLT94
737A C100      3020      CMPB     #$00
737C 260A      3021      BNE      MPFLT94
737E 59        3022      L22N    LC55D  ROLB
737F 2507      3023      BCS      MPFLT94
7381 C100      3024      CMPB     #$00
7383 2603      3025      BNE      MPFLT94
7385 7E738B    3026      JMP      L22N
              3027
7388 7E7915    3028      MPFLT94 JMP      MPFLT
              3029
              3030      ;      TESTING ROL
              3031
738B 0C        3032      L22N    CLC
738C 86AA      3033      LDAA     #$AA
738E 9710      3034      STAA     TEMP
7390 790010    3035      ROL      TEMP
7393 9610      3036      LDAA     TEMP
7395 8154      3037      CMPA     #$54
7397 2642      3038      BNE      MPFLT95
              3039
7399 790010    3040      ROL      TEMP
739C 9610      3041      LDAA     TEMP
739E 81A8      3042      CMPA     #$A8
73A0 2639      3043      BNE      MPFLT95
              3044
73A2 790010    3045      ROL      TEMP
73A5 9610      3046      LDAA     TEMP
73A7 8150      3047      CMPA     #$50
73A9 2630      3048      BNE      MPFLT95
              3049
73AB 790010    3050      ROL      TEMP
73AE 9610      3051      LDAA     TEMP
73B0 81A0      3052      CMPA     #$A0
73B2 2627      3053      BNE      MPFLT95
              3054
73B4 790010    3055      ROL      TEMP
73B7 9610      3056      LDAA     TEMP
73B9 8140      3057      CMPA     #$40
73BB 261E      3058      BNE      MPFLT95
              3059
73BD 790010    3060      ROL      TEMP
73C0 9610      3061      LDAA     TEMP
73C2 8180      3062      CMPA     #$80
73C4 2615      3063      BNE      MPFLT95
              3064
73C6 790010    3065      ROL      TEMP
73C9 9610      3066      LDAA     TEMP
73CB 8100      3067      CMPA     #$00
73CD 260C      3068      BNE      MPFLT95
              3069
73CF 790010    3070      ROL      TEMP
73D2 9610      3071      LDAA     TEMP
73D4 8100      3072      CMPA     #$00

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73D6 2603      3073          BNE      MPFLT95
73D8 7E73DE    3074          JMP      L21NN
              3075
73DB 7E7915    3076 MPFLT95    JMP      MPFLT
              3077
              3078 ;          TESTING CERTAIN FLAG INSTRUCTIONS. THE SUBROUTINES FOR THESE
              3079 ;          INSTRUCTIONS REQUIRE 'AND' AND 'OR' INSTRUCTION WHICH HAVE
              3080 ;          ALREADY BEEN TESTED AT THIS POINT.
              3081
              3082 ;          TESTING CLI INSTRUCTION
73DE 07        3083 L21NN      TPA
73DF 8A10      3084          ORAA     #$10
73E1 06        3085          TAP
              3086          ;FIRST MAKE I BIT = 1 TO MAKE SURE THAT
              ; CLI MAKES IT ZERO
73E2 0E        3087          CLI
73E3 07        3088          TPA
73E4 8410      3089          ANDA     #$10
73E6 2617      3090          BNE      MPFLT96          ;SINCE INTERRUPT BIT IS MADE ZERO THROUGH
              3091          ; CLI AND ALL OTHER BITS ARE ZERO DUE TO
              3092          ; ANDING HENCE THE EXPECTED RESULT IS ZERO

              3093
              3094 ;          TESTING SEI INSTRUCTION
73E8 07        3095          TPA
73E9 84EF      3096          ANDA     #$EF          ;FIRST MAKE I BIT = 0 TO MAKE SURE THAT
              3097          ; SEI MAKES IT ONE
73EB 06        3098          TAP
73EC 0F        3099          SEI
73ED 07        3100          TPA
73EE 8410      3101          ANDA     #$10
73F0 270D      3102          BEQ     MPFLT96          ;SINCE I BIT = 1 DUE
              3103          ; TO SEI, HENCE A NON-ZERO RESULT SHOULD
              3104          ; BE OBTAINED WHEN ANDED WITH 10H
              3105
              3106 ;          TESTING CLV INSTRUCTION
73F2 07        3107          TPA
73F3 8A02      3108          ORAA     #$02          ;FIRST MAKE V BIT = 1
73F5 06        3109          TAP
73F6 0A        3110          CLV
73F7 07        3111          TPA
73F8 8402      3112          ANDA     #$02
73FA 2603      3113          BNE      MPFLT96          ;SINCE V BIT = 0 DUE TO CLV AND ALL OTHER
              3114          ; BITS ARE MADE ZERO DUE TO ANDING
              3115          ; HENCE EXPECTED RESULT IS ZERO

73FC 7E7402    3116          JMP      L22P
              3117
73FF 7E73FF    3118 MPFLT96    JMP      MPFLT96

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3119
3120 ;          TESTING SEV INSTRUCTION
7402 07      3121 L22P    TPA
7403 84FD    3122        ANDA    #$FD          ;FIRST MAKE V BIT = 0
7405 06      3123        TAP
7406 0B      3124        SEV
7407 07      3125        TPA
7408 8402    3126        ANDA    #$02
740A 2720    3127        BEQ     MPFLT99        ;SINCE V BIT = 1 DUE
3128                                ; TO SEV, HENCE A NON-ZERO RESULT SHOULD
3129                                ; BE OBTAINED WHEN ANDED WITH 02H
3130
3131
3132 ;          TESTING BIT TEST INSTRUCTION
3133
740C 86FF    3134        LDAA    #$FF
740E 8580    3135        BITA    #$80          ;MSB OF RESULT= 1
7410 2A1A    3136        BPL     MPFLT99        ;N FLAG SHOULD BE 0
7412 8500    3137        BITA    #$00          ;RESULT = 0
7414 2616    3138        BNE     MPFLT99        ;Z FLAG SHOULD BE SET
3139
3140 ;          TESTING BRANCH CLEAR INSTRUCTION
3141
7416 8655    3142        LDAA    #$55
7418 9710    3143        STAA    TEMP
741A 1310AA03 3144        BRCLR   TEMP,$AA,LOC56
741E 7E742C  3145        JMP     MPFLT99
3146
3147 ;          TESTING BRANCH SET INSTRUCTION
7421 8655    3148 LOC56   LDAA    #$55
7423 9710    3149        STAA    TEMP
7425 12105506 3150        BRSET   TEMP,$55,LOC57
7429 7E742C  3151        JMP     MPFLT99
3152
742C 7E7915  3153 MPFLT99  JMP     MPFLT
3154
3155 ;          TESTING BCLR INSTRUCTION
742F 86FF    3156 LOC57   LDAA    #$FF
7431 9710    3157        STAA    TEMP
7433 151055  3158        BCLR   TEMP,$55
7436 86AA    3159        LDAA    #$AA
7438 9110    3160        CMPA    TEMP
743A 263E    3161        BNE     MPFLT104
3162
743C 86FF    3163        LDAA    #$FF
743E 9710    3164        STAA    TEMP
7440 1510AA  3165        BCLR   TEMP,$AA
7443 8655    3166        LDAA    #$55
7445 9110    3167        CMPA    TEMP
7447 2631    3168        BNE     MPFLT104
3169
3170 ;          TESTING BSET INSTRUCTION
7449 8600    3171        LDAA    #$00
744B 9710    3172        STAA    TEMP
744D 141055  3173        BSET   TEMP,$55
7450 8655    3174        LDAA    #$55

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7452 9110      3175      CMPA    TEMP
7454 2624      3176      BNE     MPFLT104
              3177
7456 8600      3178      LDAA   #$00
7458 9710      3179      STAA   TEMP
745A 1410AA    3180      BSET   TEMP,$AA
745D 86AA      3181      LDAA   #$AA
745F 9110      3182      CMPA   TEMP
7461 2617      3183      BNE     MPFLT104
              3184
              3185 ;      TESTING TST INSTRUCTIONS
              3186
              3187 ;      TEST TSTA
              3188
7463 86FF      3189      LDAA   #$FF      ;NEGATIVE VALUE
7465 4D        3190      TSTA
7466 2A12      3191      BPL    MPFLT104
7468 8600      3192      LDAA   #$00      ;ZERO VALUE
746A 4D        3193      TSTA
746B 260D      3194      BNE     MPFLT104
              3195
              3196 ;      TEST TSTB
              3197
746D C6FF      3198      LDAB   #$FF      ;NEGATIVE VALUE
746F 5D        3199      TSTB
7470 2A08      3200      BPL    MPFLT104
7472 C600      3201      LDAB   #$00      ;ZERO VALUE
7474 5D        3202      TSTB
7475 2603      3203      BNE     MPFLT104
7477 7E747D    3204      JMP    L22Q
              3205
747A 7E7915    3206 MPFLT104 JMP    MPFLT
              3207
              3208
              3209 ;      TEST TST
              3210
747D 86FF      3211 L22Q   LDAA   #$FF      ;NEGATIVE VALUE
747F 9710      3212      STAA   TEMP
7481 7D0010    3213      TST    TEMP
7484 2A34      3214      BPL    MPFLT108
7486 8600      3215      LDAA   #$00      ;ZERO VALUE
7488 9710      3216      STAA   TEMP
748A 7D0010    3217      TST    TEMP
748D 262B      3218      BNE     MPFLT108
              3219
              3220 ;      TESTING PUSH/PULL INSTRUCTIONS
              3221
              3222 ;      TESTING PSHA/PULA INSTRUCTIONS
748F 86FF      3223      LDAA   #$FF
7491 36        3224      PSHA
7492 8600      3225      LDAA   #$00
7494 32        3226      PULA
7495 81FF      3227      CMPA   #$FF
7497 2621      3228      BNE     MPFLT108
7499 8600      3229      LDAA   #$00
749B 36        3230      PSHA
749C 86FF      3231      LDAA   #$FF
749E 32        3232      PULA

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749F 8100      3233      CMPA    #$00
74A1 2617      3234      BNE     MPFLT108
              3235
              3236 ;          TESTING PSHB/PULB INSTRUCTIONS
74A3 C6FF      3237      LDAB   #$FF
74A5 37        3238      PSHB
74A6 C600      3239      LDAB   #$00
74A8 33        3240      PULB
74A9 C1FF      3241      CMPB   #$FF
74AB 260D      3242      BNE     MPFLT108
74AD C600      3243      LDAB   #$00
74AF 37        3244      PSHB
74B0 C6FF      3245      LDAB   #$FF
74B2 33        3246      PULB
74B3 C100      3247      CMPB   #$00
74B5 2603      3248      BNE     MPFLT108
74B7 7E74BD    3249      JMP     L22R
              3250
74BA 7E7915    3251 MPFLT108 JMP     MPFLT
              3252
              3253 ;          TESTING PSHX/PULX INSTRUCTIONS
74BD CE00FF    3254 L22R    LDX     #$FF
74C0 3C        3255      PSHX
74C1 CE0000    3256      LDX     #$00
74C4 38        3257      PULX
74C5 8C00FF    3258      CPX     #$FF
74C8 2634      3259      BNE     MPFLT111
74CA CE0000    3260      LDX     #$00
74CD 3C        3261      PSHX
74CE CE00FF    3262      LDX     #$FF
74D1 38        3263      PULX
74D2 8C0000    3264      CPX     #$00
74D5 2627      3265      BNE     MPFLT111
              3266
              3267
              3268 ;          TESTING PSHY/PULY INSTRUCTIONS
74D7 18CE00FF 3269      LDY     #$FF
74DB 183C      3270      PSHY
74DD 18CE0000 3271      LDY     #$00
74E1 1838      3272      PULY
74E3 188C00FF 3273      CPY     #$FF
74E7 2615      3274      BNE     MPFLT111
74E9 18CE0000 3275      LDY     #$00
74ED 183C      3276      PSHY
74EF 18CE00FF 3277      LDY     #$FF
74F3 1838      3278      PULY
74F5 188C0000 3279      CPY     #$00
74F9 2603      3280      BNE     MPFLT111
74FB 7E7501    3281      JMP     L22S
              3282
74FE 7E7915    3283 MPFLT111 JMP     MPFLT
              3284
              3285
              3286 ;          PUSH AND PULL INSTRUCTIONS ARE TESTED,
              3287 ;          SO NOW WE CAN TEST OTHER STACK INSTRUCTIONS
              3288
              3289 ;          TEST INS

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3290
7501 9F10      3291 L22S    STS    TEMP
7503 8E0000   3292      LDS    #$0000
7506 31       3293      INS
7507 9F12     3294      STS    TEMP2
7509 DE12     3295      LDX    TEMP2
750B 8C0001   3296      CPX    #$0001
750E 266B     3297      BNE    MPFLT113
3298
7510 8E0001   3299      LDS    #$0001
7513 31       3300      INS
7514 9F12     3301      STS    TEMP2
7516 DE12     3302      LDX    TEMP2
7518 8C0002   3303      CPX    #$0002
751B 265E     3304      BNE    MPFLT113
3305
751D 8E0003   3306      LDS    #$0003
7520 31       3307      INS
7521 9F12     3308      STS    TEMP2
7523 DE12     3309      LDX    TEMP2
7525 8C0004   3310      CPX    #$0004
7528 2651     3311      BNE    MPFLT113
3312
752A 8E0007   3313      LDS    #$0007
752D 31       3314      INS
752E 9F12     3315      STS    TEMP2
7530 DE12     3316      LDX    TEMP2
7532 8C0008   3317      CPX    #$0008
7535 2644     3318      BNE    MPFLT113
3319
7537 8E000F   3320      LDS    #$000F
753A 31       3321      INS
753B 9F12     3322      STS    TEMP2
753D DE12     3323      LDX    TEMP2
753F 8C0010   3324      CPX    #$0010
7542 2637     3325      BNE    MPFLT113
3326
7544 8E001F   3327      LDS    #$001F
7547 31       3328      INS
7548 9F12     3329      STS    TEMP2
754A DE12     3330      LDX    TEMP2
754C 8C0020   3331      CPX    #$0020
754F 262A     3332      BNE    MPFLT113
3333
7551 8E003F   3334      LDS    #$003F
7554 31       3335      INS
7555 9F12     3336      STS    TEMP2
7557 DE12     3337      LDX    TEMP2
7559 8C0040   3338      CPX    #$0040
755C 261D     3339      BNE    MPFLT113
3340
755E 8E007F   3341      LDS    #$007F
7561 31       3342      INS
7562 9F12     3343      STS    TEMP2
7564 DE12     3344      LDX    TEMP2
7566 8C0080   3345      CPX    #$0080
7569 2610     3346      BNE    MPFLT113
3347

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756B 8E00FF 3348          LDS    #$00FF
756E 31      3349          INS
756F 9F12   3350          STS    TEMP2
7571 DE12   3351          LDX    TEMP2
7573 8C0100 3352          CPX    #$0100
7576 2603   3353          BNE    MPFLT113
7578 7E757E 3354          JMP    L22T
          3355
757B 7E7915 3356 MPFLT113 JMP    MPFLT
          3357
757E 8E01FF 3358 L22T    LDS    #$01FF
7581 31      3359          INS
7582 9F12   3360          STS    TEMP2
7584 DE12   3361          LDX    TEMP2
7586 8C0200 3362          CPX    #$0200
7589 26F0   3363          BNE    MPFLT113
          3364
758B 8E03FF 3365          LDS    #$03FF
758E 31      3366          INS
758F 9F12   3367          STS    TEMP2
7591 DE12   3368          LDX    TEMP2
7593 8C0400 3369          CPX    #$0400
7596 26E3   3370          BNE    MPFLT113
          3371
7598 8E07FF 3372          LDS    #$07FF
759B 31      3373          INS
759C 9F12   3374          STS    TEMP2
759E DE12   3375          LDX    TEMP2
75A0 8C0800 3376          CPX    #$0800
75A3 26D6   3377          BNE    MPFLT113
          3378
75A5 8E0FFF 3379          LDS    #$0FFF
75A8 31      3380          INS
75A9 9F12   3381          STS    TEMP2
75AB DE12   3382          LDX    TEMP2
75AD 8C1000 3383          CPX    #$1000
75B0 26C9   3384          BNE    MPFLT113
          3385
75B2 8E1FFF 3386          LDS    #$1FFF
75B5 31      3387          INS
75B6 9F12   3388          STS    TEMP2
75B8 DE12   3389          LDX    TEMP2
75BA 8C2000 3390          CPX    #$2000
75BD 26BC   3391          BNE    MPFLT113
          3392
75BF 8E3FFF 3393          LDS    #$3FFF
75C2 31      3394          INS
75C3 9F12   3395          STS    TEMP2
75C5 DE12   3396          LDX    TEMP2
75C7 8C4000 3397          CPX    #$4000
75CA 26AF   3398          BNE    MPFLT113
          3399
75CC 8E7FFF 3400          LDS    #$7FFF
75CF 31      3401          INS
75D0 9F12   3402          STS    TEMP2
75D2 DE12   3403          LDX    TEMP2
75D4 8C8000 3404          CPX    #$8000
75D7 26A2   3405          BNE    MPFLT113

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3406
75D9 8EFFFF 3407      LDS      #$FFFF
75DC 31      3408      INS
75DD 9F12   3409      STS      TEMP2
75DF DE12   3410      LDX      TEMP2
75E1 8C0000 3411      CPX      #$0000
75E4 2695   3412      BNE      MPFLT113
3413
75E6 9E10   3414      LDS      TEMP
3415
3416 ;      TEST DES
3417
75E8 9F10   3418      STS      TEMP
75EA 8E0000 3419      LDS      #$0000
75ED 34      3420      DES
75EE 9F12   3421      STS      TEMP2
75F0 DE12   3422      LDX      TEMP2
75F2 8CFFFF 3423      CPX      #$FFFF
75F5 266B   3424      BNE      MPFLT114
3425
75F7 8E8000 3426      LDS      #$8000
75FA 34      3427      DES
75FB 9F12   3428      STS      TEMP2
75FD DE12   3429      LDX      TEMP2
75FF 8C7FFF 3430      CPX      #$7FFF
7602 265E   3431      BNE      MPFLT114
3432
7604 8E4000 3433      LDS      #$4000
7607 34      3434      DES
7608 9F12   3435      STS      TEMP2
760A DE12   3436      LDX      TEMP2
760C 8C3FFF 3437      CPX      #$3FFF
760F 2651   3438      BNE      MPFLT114
3439
7611 8E2000 3440      LDS      #$2000
7614 34      3441      DES
7615 9F12   3442      STS      TEMP2
7617 DE12   3443      LDX      TEMP2
7619 8C1FFF 3444      CPX      #$1FFF
761C 2644   3445      BNE      MPFLT114
3446
761E 8E1000 3447      LDS      #$1000
7621 34      3448      DES
7622 9F12   3449      STS      TEMP2
7624 DE12   3450      LDX      TEMP2
7626 8C0FFF 3451      CPX      #$0FFF
7629 2637   3452      BNE      MPFLT114
3453
762B 8E0800 3454      LDS      #$0800
762E 34      3455      DES
762F 9F12   3456      STS      TEMP2
7631 DE12   3457      LDX      TEMP2
7633 8C07FF 3458      CPX      #$07FF
7636 262A   3459      BNE      MPFLT114
3460
7638 8E0400 3461      LDS      #$0400
763B 34      3462      DES
763C 9F12   3463      STS      TEMP2

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763E DE12      3464      LDX      TEMP2
7640 8C03FF    3465      CPX      #$03FF
7643 261D      3466      BNE      MPFLT114
              3467
7645 8E0200    3468      LDS      #$0200
7648 34        3469      DES
7649 9F12      3470      STS      TEMP2
764B DE12      3471      LDX      TEMP2
764D 8C01FF    3472      CPX      #$01FF
7650 2610      3473      BNE      MPFLT114
              3474
7652 8E0100    3475      LDS      #$0100
7655 34        3476      DES
7656 9F12      3477      STS      TEMP2
7658 DE12      3478      LDX      TEMP2
765A 8C00FF    3479      CPX      #$00FF
765D 2603      3480      BNE      MPFLT114
765F 7E7665    3481      JMP      L22U
              3482
7662 7E7915    3483      MPFLT114 JMP      MPFLT
              3484
              3485
7665 8E0080    3486      L22U    LDS      #$0080
7668 34        3487      DES
7669 9F12      3488      STS      TEMP2
766B DE12      3489      LDX      TEMP2
766D 8C007F    3490      CPX      #$007F
7670 26F0      3491      BNE      MPFLT114
              3492
7672 8E0040    3493      LDS      #$0040
7675 34        3494      DES
7676 9F12      3495      STS      TEMP2
7678 DE12      3496      LDX      TEMP2
767A 8C003F    3497      CPX      #$003F
767D 26E3      3498      BNE      MPFLT114
              3499
767F 8E0020    3500      LDS      #$0020
7682 34        3501      DES
7683 9F12      3502      STS      TEMP2
7685 DE12      3503      LDX      TEMP2
7687 8C001F    3504      CPX      #$001F
768A 26D6      3505      BNE      MPFLT114
              3506
768C 8E0010    3507      LDS      #$0010
768F 34        3508      DES
7690 9F12      3509      STS      TEMP2
7692 DE12      3510      LDX      TEMP2
7694 8C000F    3511      CPX      #$000F
7697 26C9      3512      BNE      MPFLT114
              3513
7699 8E0008    3514      LDS      #$0008
769C 34        3515      DES
769D 9F12      3516      STS      TEMP2
769F DE12      3517      LDX      TEMP2
76A1 8C0007    3518      CPX      #$0007
76A4 26BC      3519      BNE      MPFLT114
              3520
76A6 8E0004    3521      LDS      #$0004

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```

76A9 34          3522          DES
76AA 9F12       3523          STS    TEMP2
76AC DE12       3524          LDX    TEMP2
76AE 8C0003     3525          CPX    #$0003
76B1 26AF       3526          BNE    MPFLT114
              3527
76B3 8E0002     3528          LDS    #$0002
76B6 34         3529          DES
76B7 9F12       3530          STS    TEMP2
76B9 DE12       3531          LDX    TEMP2
76BB 8C0001     3532          CPX    #$0001
76BE 26A2       3533          BNE    MPFLT114
              3534
76C0 8E0001     3535          LDS    #$0001
76C3 34         3536          DES
76C4 9F12       3537          STS    TEMP2
76C6 DE12       3538          LDX    TEMP2
76C8 8C0000     3539          CPX    #$0000
76CB 2695       3540          BNE    MPFLT114
              3541
76CD 9E10       3542          LDS    TEMP
              3543
              3544 ;          TEST TSX/TXS
              3545
76CF 9F10       3546          STS    TEMP
              3547
76D1 CE00FF     3548          LDX    #$FF
76D4 35         3549          TXS
76D5 CE0000     3550          LDX    #$00          ;X RESET TO 00
76D8 30         3551          TSX
76D9 8C00FF     3552          CPX    #$FF
76DC 262C       3553          BNE    MPFLT115
              3554
76DE CE0000     3555          LDX    #$00
76E1 35         3556          TXS
76E2 CE00FF     3557          LDX    #$FF          ;X RESET TO FF
76E5 30         3558          TSX
76E6 8C0000     3559          CPX    #$00
76E9 261F       3560          BNE    MPFLT115
              3561
76EB CE00AA     3562          LDX    #$AA
76EE 35         3563          TXS
76EF CE0055     3564          LDX    #$55          ;X RESET TO 55
76F2 30         3565          TSX
76F3 8C00AA     3566          CPX    #$AA
76F6 2612       3567          BNE    MPFLT115
              3568
76F8 CE0055     3569          LDX    #$55
76FB 35         3570          TXS
76FC CE00AA     3571          LDX    #$AA          ;X RESET TO AA
76FF 30         3572          TSX
7700 8C0055     3573          CPX    #$55
7703 2605       3574          BNE    MPFLT115
              3575
7705 9E10       3576          LDS    TEMP
7707 7E770D     3577          JMP    L22V
              3578
770A 7E7915     3579 MPFLT115 JMP    MPFLT

```

```

3580
3581 ;          TEST TSY/TYS
3582
770D 9F10    3583 L22V    STS     TEMP
3584
770F 18CE00FF 3585          LDY     #$FF
7713 1835    3586          TYS
7715 18CE0000 3587          LDY     #$00          ;Y RESET TO 00
7719 1830    3588          TSY
771B 188C00FF 3589          CPY     #$FF
771F 263B    3590          BNE     MPFLT116
3591
7721 18CE0000 3592          LDY     #$00
7725 1835    3593          TYS
7727 18CE00FF 3594          LDY     #$FF          ;Y RESET TO FF
772B 1830    3595          TSY
772D 188C0000 3596          CPY     #$00
7731 2629    3597          BNE     MPFLT116
3598
7733 18CE00AA 3599          LDY     #$AA
7737 1835    3600          TYS
7739 18CE0055 3601          LDY     #$55          ;Y RESET TO 55
773D 1830    3602          TSY
773F 188C00AA 3603          CPY     #$AA
7743 2617    3604          BNE     MPFLT116
3605
7745 18CE0055 3606          LDY     #$55
7749 1835    3607          TYS
774B 18CE00AA 3608          LDY     #$AA          ;Y RESET TO AA
774F 1830    3609          TSY
7751 188C0055 3610          CPY     #$55
7755 2605    3611          BNE     MPFLT116
3612
7757 9E10    3613          LDS     TEMP
7759 7E775F  3614          JMP     L22W
3615
3616
775C 7E7915  3617 MPFLT116 JMP     MPFLT
3618
3619 ;          TESTING XGDX INSTRUCTION
3620
775F CFFFFFFF 3621 L22W    LDD     #$FFFF
7762 CE0000   3622          LDX     #$0000
7765 8F       3623          XGDX
7766 1A830000 3624          CPD     #$0000
776A 2644    3625          BNE     MPFLT117
776C 8CFFFFFF 3626          CPX     #$FFFF
776F 263F    3627          BNE     MPFLT117
3628
7771 CAAAAA   3629          LDD     #$AAAA
7774 CE5555   3630          LDX     #$5555
7777 8F       3631          XGDX
7778 1A835555 3632          CPD     #$5555
777C 2632    3633          BNE     MPFLT117
777E 8CAAAA   3634          CPX     #$AAAA
7781 262D    3635          BNE     MPFLT117
3636
3637 ;          TESTING XGDY INSTRUCTION

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```

7783 CFFFFFF 3638      LDD    #$FFFF
7786 18CE0000 3639      LDY    #$0000
778A 188F      3640      XGDY
778C 1A830000 3641      CPD    #$0000
7790 261E      3642      BNE    MPFLT117
7792 188CFFFF 3643      CPY    #$FFFF
7796 2618      3644      BNE    MPFLT117
          3645
7798 CAAAAA    3646      LDD    #$AAAA
779B 18CE5555 3647      LDY    #$5555
779F 188F      3648      XGDY
77A1 1A835555 3649      CPD    #$5555
77A5 2609      3650      BNE    MPFLT117
77A7 188CAAAA 3651      CPY    #$AAAA
77AB 2603      3652      BNE    MPFLT117
77AD 7E77B3    3653      JMP    LOC100
          3654
77B0 7E7915    3655      MPFLT117 JMP    MPFLT
          3656
          3657
77B3 BD78E8      3658      LOC100 JSR    MPPASS
77B6 8600      3659      LDAA   #$00
77B8 B74002     3660      STAA   PORTC
          3661
77BB 39         3662      RTS
          3663
77BC B74001     3664      INSTR  STAA   PORTB
77BF C601      3665      LDAB   #$01
77C1 F74002     3666      STAB   PORTC
77C4 BD77F6     3667      JSR    WAIT120
77C7 C600      3668      LDAB   #$00
77C9 F74002     3669      STAB   PORTC
77CC 39         3670      RTS
          3671
77CD B74001     3672      DATA  STAA   PORTB
77D0 8603      3673      LDAA   #$03
77D2 B74002     3674      STAA   PORTC
77D5 BD77F6     3675      JSR    WAIT120
77D8 8602      3676      LDAA   #$02
77DA B74002     3677      STAA   PORTC
77DD 39         3678      RTS
          3679
          3680      ;***** WAIT1 *****;
          3681      ; To introduce a delay of 1 sec      ;
          3682      ;                                  ;
          3683      ;*****;
          3684
77DE 37         3685      WAIT1  PSHB
77DF C6C8      3686      LDAB   #1200
77E1 BD77E9     3687      L1     JSR    WAIT5
77E4 5A         3688      DECB
77E5 26FA      3689      BNE    L1
77E7 33         3690      PULB
77E8 39         3691      RTS
          3692
          3693      ;***** WAIT5 *****;
          3694      ; To introduce a delay of 5 msec      ;

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```

3695 ; ;
3696 ;*****;
3697
77E9 3C 3698 WAIT5 PSHX
77EA CE03E8 3699 LDX #!1000
77ED 01 3700 L2 NOP
77EE 09 3701 DEX
77EF 8C0000 3702 CPX #$0000
77F2 26F9 3703 BNE L2
77F4 38 3704 PULX
77F5 39 3705 RTS
3706
3707 ;***** WAIT120 *****;
3708 ; To introduce a delay of 120 usec ;
3709 ; ;
3710 ;*****;
3711
77F6 3C 3712 WAIT120 PSHX
77F7 CE001E 3713 LDX #!30
77FA 01 3714 L3 NOP
77FB 09 3715 DEX
77FC 8C0000 3716 CPX #$0000
77FF 26F9 3717 BNE L3
7801 38 3718 PULX
7802 39 3719 RTS
3720
3721 ;***** NORMOPER *****;
3722 ; System program. Run in a continuous mode, ;
3723 ; take data from A/D converter and display ;
3724 ; the corresponding result ;
3725 ;*****;
3726
3727
3728 NORMOPER
3729 ;LDAA #$01 ;ENABLE INPUT FROM ANALOG THERM
3730 ;STAA PORTC ;TO BE USED FOR VHDL MODEL

7803 BD7B0D 3731 JSR DISPINIT21
7806 B64000 3732 LDAA PORTA ;READ FROM A/D CONVERTER

7809 8880 3733 EORA #$80 ;MAKE (00 - FF) CORRESPOND T(128 TO
;+127)
780B 9710 3734 STAA TEMP ;HEXADECIMAL RESULT IN TEMP

780D 8480 3735 ANDA #$80 ;IS THE NUMBER POSITIVE OR NEGATIVE?

3736
780F 2703 3737 BEQ POS_RESULT
7811 7E78D4 3738 JMP NEG_RESULT
3739
7814 862B 3740 POS_RESULTLDAA #$2B ;DISPLAY '+' FIRST
7816 B74001 3741 STAA PORTB
7819 BD77CD 3742 JSR DATA

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3743
3744      ;LDAA    #$04      ;SET DATAVAIL SIGNAL
3745      ;STAA    PORTC    ;TO BE USED FOR VHDL MODEL
3746      ;JSR     STROBE
3747
3748
781C 9610 3749      LDAA    TEMP
3750
781E 818C 3751  L1B    CMPA    #$8C
7820 2438 3752      BHS     CF1
7822 8182 3753      CMPA    #$82
7824 2439 3754      BHS     CF2
7826 8178 3755      CMPA    #$78
7828 243A 3756      BHS     CF3
3757
782A 816E 3758      CMPA    #$6E
782C 243B 3759      BHS     CF4
782E 8164 3760      CMPA    #$64
7830 243C 3761      BHS     CF5
3762
7832 815A 3763      CMPA    #$5A
7834 243D 3764      BHS     CF6
7836 8150 3765      CMPA    #$50
7838 243E 3766      BHS     CF7
3767
783A 8146 3768      CMPA    #$46
783C 243F 3769      BHS     CF8
783E 813C 3770      CMPA    #$3C
7840 2440 3771      BHS     CF9
3772
7842 8132 3773      CMPA    #$32
7844 2441 3774      BHS     CF10
7846 8128 3775      CMPA    #$28
7848 2442 3776      BHS     CF11
3777
784A 811E 3778      CMPA    #$1E
784C 2443 3779      BHS     CF12
784E 8114 3780      CMPA    #$14
7850 2444 3781      BHS     CF13
3782
7852 810A 3783      CMPA    #$0A
7854 2445 3784      BHS     CF14
3785
7856 0C    3786      CLC
7857 7E78A0 3787      JMP     L1A1      ;IF RESULT <= 9, NO CORRECTION
3788
3789      ;NEED TO BE APPLIED
785A 8BB4 3790  CF1    ADDA    #$B4      ;CORRECTION FACTOR
3791
785C 7E78A0 3791      JMP     L1A1
3792
785F 8BAE 3793  CF2    ADDA    #$AE
7861 7E78A0 3794      JMP     L1A1
3795
7864 8BA8 3796  CF3    ADDA    #$A8
7866 7E78A0 3797      JMP     L1A1

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3798
7869 8BA2      3799 CF4      ADDA    #$A2
786B 7E78A0    3800      JMP     L1A1
3801
786E 8B9C      3802 CF5      ADDA    #$9C
7870 7E78A0    3803      JMP     L1A1
3804
7873 8B36      3805 CF6      ADDA    #$36
7875 7E78A0    3806      JMP     L1A1
3807
7878 8B30      3808 CF7      ADDA    #$30
787A 7E78A0    3809      JMP     L1A1
3810
787D 8B2A      3811 CF8      ADDA    #$2A
787F 7E78A0    3812      JMP     L1A1
3813
7882 8B24      3814 CF9      ADDA    #$24
7884 7E78A0    3815      JMP     L1A1
3816
7887 8B1E      3817 CF10     ADDA    #$1E
7889 7E78A0    3818      JMP     L1A1
3819
788C 8B18      3820 CF11     ADDA    #$18
788E 7E78A0    3821      JMP     L1A1
3822
7891 8B12      3823 CF12     ADDA    #$12
7893 7E78A0    3824      JMP     L1A1
3825
7896 8B0C      3826 CF13     ADDA    #$0C
7898 7E78A0    3827      JMP     L1A1
3828
789B 8B06      3829 CF14     ADDA    #$06
789D 7E78A0    3830      JMP     L1A1
3831
3832
78A0 9712      3833 L1A1     STAA    TEMP2          ;STORE PACKED BCD RESULT IN TEMP2
3834
78A2 240A      3834      BCC     L1A
78A4 8631      3835      LDAA   #$31          ;IF CARRY IS SET, IT MEANS RESULT IS
3836          ;GREATER THAN 100, SO DISPLAY THE
          ;LEFTMOST 1
3837
78A6 B74001     3837      STAA   PORTB
78A9 BD77CD     3838      JSR   DATA
78AC 9612      3839      LDAA   TEMP2          ;LOAD PACKED BCD RESULT IN 'A'
3840
78AE 84F0      3840 L1A     ANDA   #$F0
78B0 44        3841      LSRA  LSRA
78B1 44        3842      LSRA  LSRA
78B2 44        3843      LSRA  LSRA
78B3 44        3844      LSRA  LSRA
78B4 8A30      3845      ORAA  #$30
78B6 B74001     3846      STAA  PORTB          ;OUTPUT TO LCD DRIVER
78B9 BD77CD     3847      JSR   DATA
78BC 9612      3848      LDAA  TEMP2
78BE 840F      3849      ANDA  #$0F
78C0 8A30      3850      ORAA  #$30
78C2 B74001     3851      STAA  PORTB          ;OUTPUT TO LCD DRIVER

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```

78C5 BD77CD 3852 JSR DATA
3853 ;JMP LIC
78C8 BD77DE 3854 JSR WAIT1
78CB BD77DE 3855 JSR WAIT1
78CE BD77DE 3856 JSR WAIT1
78D1 7E7803 3857 JMP NORMOPER
3858
3859
3860
78D4 862D 3861 NEG_RESULTLDAA #$2D ;OUTPUT '-' FIRST
78D6 B74001 3862 STAA PORTB
78D9 BD77CD 3863 JSR DATA
78DC 9610 3864 LDAA TEMP
78DE 40 3865 NEGA
78DF 7E781E 3866 JMP L1B
3867
78E2 8600 3868 LIC LDAA #$00
78E4 B74002 3869 STAA PORTC ;DISABLE INPUT FROM ANALOG THERM

3870
78E7 39 3871 RTS
3872
3873
78E8 BD7B0D 3874 MPPASS JSR DISPINIT21
78EB BD7945 3875 JSR MICRO
78EE BD7B26 3876 JSR DISPINIT22
78F1 BD7992 3877 JSR PASS
78F4 39 3878 RTS
3879
78F5 BD78E8 3880 MPPASS1 JSR MPPASS
78F8 BD7AA4 3881 JSR OUTONE
78FB BD77DE 3882 JSR WAIT1
78FE BD77DE 3883 JSR WAIT1
7901 BD77DE 3884 JSR WAIT1
7904 39 3885 RTS
3886
7905 BD78E8 3887 MPPASS2 JSR MPPASS
7908 BD7AAD 3888 JSR OUTWO
790B BD77DE 3889 JSR WAIT1
790E BD77DE 3890 JSR WAIT1
7911 BD77DE 3891 JSR WAIT1
7914 39 3892 RTS
3893
7915 BD7B0D 3894 MPFLT JSR DISPINIT21
7918 BD792F 3895 JSR ERROR
791B BD7B26 3896 JSR DISPINIT22
791E BD7945 3897 JSR MICRO
7921 7E7B9A 3898 JMP STP
3899
3900
3901 ;***** STROBE *****;
3902 ; To activate the strobe, used in VHDL model ;
3903 ; only ;
3904 ;*****;
3905
7924 8606 3906 STROBE LDAA #$06
7926 B74002 3907 STAA PORTC ;SET STROBE HIGH ALSO KEEPING
;DATAVAIL HIGH

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```

7929 8604      3908          LDAA    #$04
792B B74002    3909          STAA    PORTC      ;RESET THE STROBE
792E 39        3910          RTS
              3911
              3912
              3913          ;***** ERROR *****;
              3914          ; Send ERROR message to display      ;
              3915          ;                                           ;
              3916          ;*****;
              3917
              3918
792F BD79C3    3919  ERROR      JSR     OUTE
7932 BD7A38    3920          JSR     OUTR
7935 BD7A38    3921          JSR     OUTR
7938 BD7A1D    3922          JSR     OUTO
793B BD7A38    3923          JSR     OUTR
793E BD7A9B    3924          JSR     OUTCOL
7941 BD7A92    3925          JSR     OUTSP
7944 39        3926          RTS
              3927
              3928
              3929
              3930          ;***** MICRO *****;
              3931          ; Send MICROCONTROLLER message to display      ;
              3932          ;                                           ;
              3933          ;*****;
              3934
7945 BD7A0B    3935  MICRO      JSR     OUTM
7948 BD79E7    3936          JSR     OUTI
794B BD79B1    3937          JSR     OUTC
794E BD7A38    3938          JSR     OUTR
7951 BD7A1D    3939          JSR     OUTO
7954 BD79B1    3940          JSR     OUTC
7957 BD7A1D    3941          JSR     OUTO
795A BD7A14    3942          JSR     OUTN
795D BD7A4A    3943          JSR     OUTT
7960 BD7A38    3944          JSR     OUTR
7963 BD7A1D    3945          JSR     OUTO
7966 BD7A02    3946          JSR     OUTL
7969 BD7A02    3947          JSR     OUTL
796C BD79C3    3948          JSR     OUTE
796F BD7A38    3949          JSR     OUTR
7972 BD7A92    3950          JSR     OUTSP
7975 39        3951          RTS
              3952
              3953
              3954          ;***** EXTERNAL *****;
              3955          ; Send EXTERNAL message to display      ;
              3956          ;                                           ;
              3957          ;*****;
              3958
7976 BD79C3    3959  EXTERNAL   JSR     OUTE
7979 BD7A65    3960          JSR     OUTX
797C BD7A4A    3961          JSR     OUTT

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797F BD79C3 3962      JSR    OUTE
7982 BD7A38 3963      JSR    OUTR
7985 BD7A14 3964      JSR    OUTN
7988 BD799F 3965      JSR    OUTA
798B BD7A02 3966      JSR    OUTL
798E BD7A92 3967      JSR    OUTSP
7991 39      3968      RTS
              3969
              3970
              3971      ;***** EXTERNAL *****;
              3972      ; Send PASS message to display      ;
              3973      ;                                  ;
              3974      ;*****;
              3975
7992 BD7A26 3976      PASS    JSR    OUTP
7995 BD799F 3977      JSR    OUTA
7998 BD7A41 3978      JSR    OUTS
799B BD7A41 3979      JSR    OUTS
799E 39      3980      RTS
              3981
              3982
              3983      ;***** OUT ASCII *****;
              3984      ; Send ASCII characters to display      ;
              3985      ;                                  ;
              3986      ;*****;
              3987
              3988
              3989
799F 8641 3990      OUTA    LDAA    #$41      ; 'A'
79A1 B74001 3991      STAA   PORTB
79A4 BD77CD 3992      JSR    DATA
79A7 39      3993      RTS
              3994
79A8 8642 3995      OUTB    LDAA    #$42      ; 'B'
79AA B74001 3996      STAA   PORTB
79AD BD77CD 3997      JSR    DATA
79B0 39      3998      RTS
              3999
79B1 8643 4000      OUTC    LDAA    #$43      ; 'C'
79B3 B74001 4001      STAA   PORTB
79B6 BD77CD 4002      JSR    DATA
79B9 39      4003      RTS
              4004
79BA 8644 4005      OUTD    LDAA    #$44      ; 'D'
79BC B74001 4006      STAA   PORTB
79BF BD77CD 4007      JSR    DATA
79C2 39      4008      RTS
              4009
79C3 8645 4010      OUTE    LDAA    #$45      ; 'E'
79C5 B74001 4011      STAA   PORTB
79C8 BD77CD 4012      JSR    DATA
79CB 39      4013      RTS
              4014
79CC 8646 4015      OUTF    LDAA    #$46      ; 'F'
79CE B74001 4016      STAA   PORTB
79D1 BD77CD 4017      JSR    DATA

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79D4 39          4018          RTS
                  4019
79D5 8647        4020 OUTG        LDAA    #$47          ; 'G'
79D7 B74001      4021          STAA    PORTB
79DA BD77CD      4022          JSR     DATA
79DD 39          4023          RTS
                  4024
79DE 8648        4025 OUTH        LDAA    #$48          ; 'H'
79E0 B74001      4026          STAA    PORTB
79E3 BD77CD      4027          JSR     DATA
79E6 39          4028          RTS
                  4029
79E7 8649        4030 OUTI        LDAA    #$49          ; 'I'
79E9 B74001      4031          STAA    PORTB
79EC BD77CD      4032          JSR     DATA
79EF 39          4033          RTS
                  4034
79F0 864A        4035 OUTJ        LDAA    #$4A          ; 'J'
79F2 B74001      4036          STAA    PORTB
79F5 BD77CD      4037          JSR     DATA
79F8 39          4038          RTS
                  4039
79F9 864B        4040 OUTK        LDAA    #$4B          ; 'K'
79FB B74001      4041          STAA    PORTB
79FE BD77CD      4042          JSR     DATA
7A01 39          4043          RTS
                  4044
7A02 864C        4045 OUTL        LDAA    #$4C          ; 'L'
7A04 B74001      4046          STAA    PORTB
7A07 BD77CD      4047          JSR     DATA
7A0A 39          4048          RTS
                  4049
7A0B 864D        4050 OUTM        LDAA    #$4D          ; 'M'
7A0D B74001      4051          STAA    PORTB
7A10 BD77CD      4052          JSR     DATA
7A13 39          4053          RTS
                  4054
7A14 864E        4055 OUTN        LDAA    #$4E          ; 'N'
7A16 B74001      4056          STAA    PORTB
7A19 BD77CD      4057          JSR     DATA
7A1C 39          4058          RTS
                  4059
7A1D 864F        4060 OUTO        LDAA    #$4F          ; 'O'
7A1F B74001      4061          STAA    PORTB
7A22 BD77CD      4062          JSR     DATA
7A25 39          4063          RTS
                  4064
7A26 8650        4065 OUTP        LDAA    #$50          ; 'P'
7A28 B74001      4066          STAA    PORTB
7A2B BD77CD      4067          JSR     DATA
7A2E 39          4068          RTS
                  4069
7A2F 8651        4070 OUTQ        LDAA    #$51          ; 'Q'
7A31 B74001      4071          STAA    PORTB
7A34 BD77CD      4072          JSR     DATA
7A37 39          4073          RTS
                  4074
7A38 8652        4075 OUTR        LDAA    #$52          ; 'R'

```



```

7A3A B74001 4076          STAA  PORTB
7A3D BD77CD 4077          JSR   DATA
7A40 39      4078          RTS
              4079
7A41 8653   4080  OUTS    LDAA  #$53      ;'S'
7A43 B74001 4081          STAA  PORTB
7A46 BD77CD 4082          JSR   DATA
7A49 39      4083          RTS
              4084
7A4A 8654   4085  OUTT    LDAA  #$54      ;'T'
7A4C B74001 4086          STAA  PORTB
7A4F BD77CD 4087          JSR   DATA
7A52 39      4088          RTS
              4089
7A53 8655   4090  OUTU    LDAA  #$55      ;'U'
7A55 B74001 4091          STAA  PORTB
7A58 BD77CD 4092          JSR   DATA
7A5B 39      4093          RTS
              4094
7A5C 8656   4095  OUTV    LDAA  #$56      ;'V'
7A5E B74001 4096          STAA  PORTB
7A61 BD77CD 4097          JSR   DATA
7A64 39      4098          RTS
              4099
7A65 8658   4100  OUTX    LDAA  #$58      ;'X'
7A67 B74001 4101          STAA  PORTB
7A6A BD77CD 4102          JSR   DATA
7A6D 39      4103          RTS
              4104
7A6E 8659   4105  OUTY    LDAA  #$59      ;'Y'
7A70 B74001 4106          STAA  PORTB
7A73 BD77CD 4107          JSR   DATA
7A76 39      4108          RTS
              4109
7A77 865A   4110  OUTZ    LDAA  #$5A      ;'Z'
7A79 B74001 4111          STAA  PORTB
7A7C BD77CD 4112          JSR   DATA
7A7F 39      4113          RTS
              4114
7A80 862F   4115  OUTSL   LDAA  #$2F      ;'/'
7A82 B74001 4116          STAA  PORTB
7A85 BD77CD 4117          JSR   DATA
7A88 39      4118          RTS
              4119
7A89 862E   4120  OUTDOT  LDAA  #$2E      ;'.'
7A8B B74001 4121          STAA  PORTB
7A8E BD77CD 4122          JSR   DATA
7A91 39      4123          RTS
              4124
7A92 8620   4125  OUTSP   LDAA  #$20      ;' '
7A94 B74001 4126          STAA  PORTB
7A97 BD77CD 4127          JSR   DATA
7A9A 39      4128          RTS
              4129
7A9B 863A   4130  OUTCOL  LDAA  #$3A      ;':'
7A9D B74001 4131          STAA  PORTB
7AA0 BD77CD 4132          JSR   DATA
7AA3 39      4133          RTS

```

```

4134
7AA4 8631 4135 OUTONE LDAA #$31 ;'1'
7AA6 B74001 4136 STAA PORTB
7AA9 BD77CD 4137 JSR DATA
7AAC 39 4138 RTS
4139
7AAD 8632 4140 OUTWO LDAA #$32 ;'2'
7AAF B74001 4141 STAA PORTB
7AB2 BD77CD 4142 JSR DATA
7AB5 39 4143 RTS
4144
7AB6 8633 4145 OUT3 LDAA #$33 ;'3'
7AB8 B74001 4146 STAA PORTB
7ABB BD77CD 4147 JSR DATA
7ABE 39 4148 RTS
4149
4150 RSPASS ;JSR INIT1
7ABF BD7B0D 4151 JSR DISPINIT21
7AC2 BD7A38 4152 JSR OUTR
7AC5 BD799F 4153 JSR OUTA
7AC8 BD7A0B 4154 JSR OUTM
7ACB BD7A92 4155 JSR OUTSP
7ACE BD7992 4156 JSR PASS
7AD1 39 4157 RTS
4158
4159 ;***** DISPINIT *****;
4160 ; Initialize the display ;
4161 ; ;
4162 ;*****;
4163
4164
7AD2 BD77DE 4165 DISPINIT JSR WAIT1
7AD5 8600 4166 LDAA #$00
7AD7 B74002 4167 STAA PORTC
7ADA BD77E9 4168 JSR WAIT5
7ADD BD77E9 4169 JSR WAIT5
7AE0 BD77E9 4170 JSR WAIT5
7AE3 8638 4171 LDAA #$38
7AE5 BD77BC 4172 JSR INSTR
7AE8 BD77E9 4173 JSR WAIT5
7AEB 8638 4174 LDAA #$38
7AED BD77BC 4175 JSR INSTR
7AF0 BD77F6 4176 JSR WAIT120
7AF3 8638 4177 LDAA #$38
7AF5 BD77BC 4178 JSR INSTR
7AF8 8638 4179 LDAA #$38
7AFA BD77BC 4180 JSR INSTR
7AFD 8680 4181 LDAA #$80
7AFF BD77BC 4182 JSR INSTR
7B02 8606 4183 LDAA #$06
7B04 BD77BC 4184 JSR INSTR
7B07 860F 4185 LDAA #$0F
7B09 BD77BC 4186 JSR INSTR
7B0C 39 4187 RTS
4188
4189

```

```

4190 ;***** DISPINIT21 *****;
4191 ; Enable the display starting from 1st line ;
4192 ; and 1st column ;
4193 ;*****;
4194
7B0D 8601 4195 DISPINIT21LDAA #$01 ;CLEAR DISPLAY
7B0F BD77BC 4196 JSR INSTR
7B12 BD77E9 4197 JSR WAIT5
7B15 8602 4198 LDAA #$02 ;CURSOR HOME
7B17 BD77BC 4199 JSR INSTR
7B1A BD77E9 4200 JSR WAIT5
7B1D 8680 4201 LDAA #$80 ;1ST LINE, 1ST COLUMN
7B1F BD77BC 4202 JSR INSTR
7B22 BD77E9 4203 JSR WAIT5
7B25 39 4204 RTS
4205
4206 ;***** DISPINIT22 *****;
4207 ; Enable the display starting from 2nd line ;
; and 1st column ;
4208 ;*****;
4209
4210
7B26 8602 4211 DISPINIT22LDAA #$02 ;CLEAR DISPLAY
7B28 BD77BC 4212 JSR INSTR
7B2B BD77E9 4213 JSR WAIT5
7B2E 86C0 4214 LDAA #$C0 ;2ND LINE, 1ST COLUMN
7B30 BD77BC 4215 JSR INSTR
7B33 BD77E9 4216 JSR WAIT5
7B36 39 4217 RTS
4218
4219
4220 ;***** DISPCHECK *****;
4221 ; Send DISPLAY PASS message to display ;
4222 ; ;
4223 ;*****;
4224
4225
7B37 BD7B0D 4226 DISPCHECK JSR DISPINIT21
7B3A BD79BA 4227 JSR OUTD
7B3D BD79E7 4228 JSR OUTI
7B40 BD7A41 4229 JSR OUTS
7B43 BD7A26 4230 JSR OUTP
7B46 BD7A02 4231 JSR OUTL
7B49 BD799F 4232 JSR OUTA
7B4C BD7A6E 4233 JSR OUTY
7B4F BD7A92 4234 JSR OUTSP
7B52 BD7A26 4235 JSR OUTP
7B55 BD799F 4236 JSR OUTA
7B58 BD7A41 4237 JSR OUTS
7B5B BD7A41 4238 JSR OUTS
7B5E BD77DE 4239 JSR WAIT1
7B61 BD77DE 4240 JSR WAIT1
7B64 BD77DE 4241 JSR WAIT1
7B67 39 4242 RTS
4243
4244

```

```

4245
4246 ;***** SETCOPRST *****;
4247 ; Configure the COP reset mechanism ;
4248 ; ;
4249 ;*****;
4250
7B68 07 4251 SETCOPRST TPA
7B69 843F 4252 ANDA #3F ;CLEAR THE STOP AND X BIT OF CCR
7B6B 06 4253 TAP ;SO THAT STOP IS ENABLED

7B6C B61039 4254 LDAA OPTION ;SET COP RESET TIMEOUT=2.098 SEC

7B6F 8A03 4255 ORAA #3 ;FOR 4 MHZ CRYSTAL
7B71 B71039 4256 STAA OPTION
7B74 867E 4257 LDAA #7E ;PUT THE OPCODE OF
7B76 9780 4258 STAA $0080 ;"JMP CPROTINE" AT THE VECTOR
7B78 CE7B7E 4259 LDX #CPROTINE ;ADDRESS OF COP RESET
7B7B DF81 4260 STX $0081
7B7D 39 4261 RTS
4262
4263 ;***** DISPCHECK *****;
4264 ; Send TIMEOUT message to display ;
4265 ; ;
4266 ;*****;
4267
7B7E 07 4268 CPROTINE TPA
7B7F 843F 4269 ANDA #3F ;CLEAR THE STOP AND X BIT OF CCR
7B81 06 4270 TAP ;SO THAT STOP IS ENABLED
7B82 BD7A4A 4271 JSR OUTT
7B85 BD79E7 4272 JSR OUTI
7B88 BD7A0B 4273 JSR OUTM
7B8B BD79C3 4274 JSR OUTE
7B8E BD7A1D 4275 JSR OUTO
7B91 BD7A53 4276 JSR OUTU
7B94 BD7A4A 4277 JSR OUTT
7B97 7E7B9A 4278 JMP STP
4279
7B9A 8600 4280 STP LDAA #00
7B9C B74002 4281 STAA PORTC
7B9F 01 4282 NOP
7BA0 CF 4283 STOP
4284
4285
4286

```

Symbol Table

```

BEGIN 6000
CF1 785A
CF10 7887
CF11 788C
CF12 7891

```

CF13	7896
CF14	789B
CF2	785F
CF3	7864
CF4	7869
CF5	786E
CF6	7873
CF7	7878
CF8	787D
CF9	7882
CHKLOC	7FFF
COMMAND	4003
COPRST	103A
CPROTINE	7B7E
DATA	77CD
DISPCHECK	7B37
DISPINIT	7AD2
DISPINIT21	7B0D
DISPINIT22	7B26
ERAMSTART	633D
ERROR	792F
ERSFAULT	639B
ERSPASS	63AD
EXTERNAL	7976
INITERAM	2000
INITMICRO1	6063
INITRAM	0000
INITROM	6000
INSTR	77BC
L1	77E1
L1A	78AE
L1A1	78A0
L1B	781E
L1C	78E2
L2	77ED
L20A	655A
L20BB	659F
L20C	6671
L20D	66EC
L20E	6731
L20F	6217
L20G	6776
L21A	69C5
L21B	6986
L21C	69C8
L21D	6A06
L21DD	6A2C
L21E	6A52
L21EE	6A88
L21F	6AAE
L21G	6AE0
L21H	6B1E
L21J	6B44
L21K	6B6A
L21L	6BA0
L21LL	6BC6
L21M	6148
L21N	6C2C

L21NN	73DE
L21P	6C92
L21Q	6CF8
L21R	6D28
L21S	6D59
L21T	6D83
L21U	6DB5
L21V	62B6
L21W	6DE7
L21X	6E19
L21Y	6E4B
L21Z	6E7D
L22A	6E9F
L22B	6EC1
L22C	6EFB
L22D	6F79
L22E	7036
L22F	7070
L22G	70AA
L22H	70E4
L22J	7124
L22K	71E1
L22L	7234
L22M	734A
L22N	738B
L22P	7402
L22Q	747D
L22R	74BD
L22S	7501
L22T	757E
L22U	7665
L22V	770D
L22W	775F
L24	6971
L24A1	697C
L3	77FA
LC2	6344
LC20A	6091
LC20B	60BF
LC20C	60F9
LC20D	6138
LC20DA	612F
LC20E	64BD
LC20F	64F7
LC20F1	650C
LC20G	6515
LC20H	61AE
LC20I	6605
LC20J	6253
LC20K	67E8
LC22A	6906
LC24A	693B
LC24AA	6936
LC24AB	6952
LC24AC	695F
LC24AD	696C
LC24B	6135
LC24D	698E

LC24E	6993
LC24F	6998
LC24G	699D
LC24H	69A2
LC24I	69A7
LC24J	69AC
LC24K	69B1
LC25A	69CD
LC25B	69D2
LC25C	69D7
LC25D	69DC
LC25E	69E1
LC25F	69E6
LC25G	69EB
LC25GG	69F0
LC3	6353
LC33A	6D17
LC33B	6D3A
LC35A	6F1D
LC35B	6F24
LC35C	6F32
LC4	636B
LC40A	6FBD
LC40B	6FCB
LC40C	6FD9
LC40D	6FED
LC43A	70BB
LC43B	70C9
LC43C	70D7
LC47A	7176
LC47B	7184
LC47C	7192
LC47D	71A6
LC5	6383
LC50A	7275
LC50B	7286
LC50C	7294
LC50D	72A2
LC50E	72B6
LC55A	7354
LC55B	7362
LC55C	7370
LC55D	737E
LOC10	62F6
LOC100	77B3
LOC2	63B9
LOC20	68C8
LOC20A	68C3
LOC21	68DC
LOC22	68F0
LOC23	690A
LOC24	691F
LOC3	63C4
LOC34	6F02
LOC35	6F10
LOC36	6F3F
LOC37	6F83
LOC38	6F91

LOC39	6F9F
LOC4	63D7
LOC40	6FB3
LOC41	7081
LOC42	708F
LOC43	709D
LOC44	7135
LOC45	7143
LOC46	7151
LOC47	7165
LOC48	7245
LOC49	7253
LOC5	63EA
LOC50	7261
LOC51	7309
LOC52	7313
LOC53	7321
LOC54	732F
LOC55	733D
LOC56	7421
LOC57	742F
LOC6	6436
LOC7	6441
LOC8	6454
LOC9	6467
MICRO	7945
MPFLT	7915
MPFLT1	608E
MPFLT10	6214
MPFLT100	696E
MPFLT104	747A
MPFLT108	74BA
MPFLT11	6602
MPFLT111	74FE
MPFLT113	757B
MPFLT114	7662
MPFLT115	770A
MPFLT116	775C
MPFLT117	77B0
MPFLT12	66E9
MPFLT13	672E
MPFLT14	6773
MPFLT15	6250
MPFLT16	67E5
MPFLT17	68C0
MPFLT18	6903
MPFLT19	6933
MPFLT2	60BC
MPFLT20	694F
MPFLT21	695C
MPFLT22	6969
MPFLT23	6983
MPFLT3	60F6
MPFLT300	61AB
MPFLT32	69C2
MPFLT33	6A03
MPFLT4	612C
MPFLT5	64BA

MPFLT50	6A29
MPFLT51	6A4F
MPFLT51A	6A85
MPFLT52	6AAB
MPFLT53	6ADD
MPFLT54	6B1B
MPFLT55	6B41
MPFLT56	6B67
MPFLT57	6B9D
MPFLT58	6BC3
MPFLT59	6C29
MPFLT6	64F4
MPFLT61	6C8F
MPFLT62	6CF5
MPFLT63	6D25
MPFLT65	6D56
MPFLT66	6D80
MPFLT67	6DB2
MPFLT68	6DE4
MPFLT69	62E5
MPFLT7	6512
MPFLT70	6E16
MPFLT71	6E48
MPFLT72	6E7A
MPFLT73	6E9C
MPFLT74	6EBE
MPFLT75	6EF8
MPFLT76	6F1A
MPFLT77	6F3C
MPFLT78	6F76
MPFLT79	6FB0
MPFLT8	6557
MPFLT80	6FEA
MPFLT81	7033
MPFLT82	706D
MPFLT83	70A7
MPFLT84	70E1
MPFLT85	7121
MPFLT86	7162
MPFLT87	71A3
MPFLT88	71DE
MPFLT89	7231
MPFLT9	659C
MPFLT90	7272
MPFLT91	72B3
MPFLT92	7306
MPFLT93	7347
MPFLT94	7388
MPFLT95	73DB
MPFLT96	73FF
MPFLT99	742C
MPPASS	78E8
MPPASS1	78F5
MPPASS2	7905
MPTEST	6477
NEG_RESULT	78D4
NORMOPER	7803
OPTION	1039

OUT3	7AB6
OUTA	799F
OUTB	79A8
OUTC	79B1
OUTCOL	7A9B
OUTD	79BA
OUTDOT	7A89
OUTE	79C3
OUTF	79CC
OUTG	79D5
OUTH	79DE
OUTI	79E7
OUTJ	79F0
OUTK	79F9
OUTL	7A02
OUTM	7A0B
OUTN	7A14
OUTO	7A1D
OUTONE	7AA4
OUTP	7A26
OUTQ	7A2F
OUTR	7A38
OUTS	7A41
OUTSL	7A80
OUTSP	7A92
OUTT	7A4A
OUTU	7A53
OUTV	7A5C
OUTWO	7AAD
OUTX	7A65
OUTY	7A6E
OUTZ	7A77
PASS	7992
PORTA	4000
PORTB	4001
PORTC	4002
POS_RESULT	7814
RAMSTART1	63B4
RAMSTART2	6431
ROMSFLT	630F
ROMSPASS	6321
ROMTEST	62EC
RSFAULT	63FF
RSPASS	7ABF
RSPASS1	6411
RSPASS2	6421
SETCOPRST	7B68
STP	7B9A
STROBE	7924
TEMP	0010
TEMP2	0012
WAIT1	77DE
WAIT120	77F6
WAIT5	77E9

APPENDIX B

C PROGRAM TO CALCULATE CHECKSUM OF THE SYSTEM PROGRAM

```
# include <stdio.h>
# include <string.h>
# include <conio.h>

void main(void)
{
    FILE *fptr1;
    FILE *fptr2;
    FILE *fptr3;
    char string[80];
    int val1;
    int val2 = 0;
    int carry = 0;
    int checksum = 0;
    fptr1 = fopen("rom.mif","r"); // Open the obj file
                                // that contains
                                // both the addresses and contents
                                // of ROM
    fptr2 = fopen("rom2.txt","w");// Open the file for writing, that
                                // will contain only the actual
                                // contents of ROM
    while (fgets(string,10,fptr1) != NULL)
    {
        fputc(string[5],fptr2);
        fputc(string[6],fptr2);
        fputs("\n",fptr2);
    }
    fclose(fp2);
    fclose(fp1);
    fptr3 = fopen("rom2.txt","r");// Open the ROM contents file to read
                                // the contents in HEX format

    while (fscanf(fp3,"%x",&val1) != EOF)
    {
        val2 = val2 + val1 + carry;

        if (val2 > 255)
        {
            carry = 1;
            val2 = val2 - 256;
        }
        else
        {
            carry = 0;
        }
    }
    fclose(fp3);
    if (val2 == 170)
```

```

    {
        checksum = 0;
        printf("ROM checksum is %xH\n",checksum);
    }
else
{
checksum = 170 - val2 - carry;
    if ((170 - val2) >= 0)
        // want to make sum including checksum byte //
        // to be AAH
        printf("ROM checksum is %xH\n",checksum);
    else
        printf("ROM checksum is %xH\n",checksum & 255);
        // This will get
        // rid of the leading 1's for negative //result
}
}
}

```

APPENDIX C

VHDL SOURCE CODE FOR TEMPERATURE MONITORING SYSTEM

C-1 : TOP LEVEL PROGRAM CODE

-- VHDL Model Created from SGE Schematic therm9.sch -- Jul 6 16:29:49 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity THERM9 is
end THERM9;

architecture SCHEMATIC of THERM9 is

  signal      PA : std_logic_vector(0 to 7);
  signal      PE : std_logic_vector(0 to 7);
  signal      PORTB : std_logic_vector(7 downto 0);
  signal      PORTA : std_logic_vector(7 downto 0);
  signal      PORTC : std_logic_vector(7 downto 0);
  signal      AD : std_logic_vector(15 downto 0);
  signal      HC138_Y : std_logic_vector(7 downto 0);
  signal      HC138_A : std_logic_vector(2 downto 0);
  signal      R2864_A : std_logic_vector(12 downto 0);
  signal      PD : std_logic_vector(0 to 5);
  signal      DISPLAY : STRING(1 to 25);
  signal      N_2 : std_logic;
  signal      A15 : std_logic;
  signal      T_ANALOG : REAL;
  signal      RESET_P : std_logic;
  signal      GND : STD_LOGIC;
  signal      E : STD_LOGIC;
  signal      AS : STD_LOGIC;
  signal      MODA : STD_LOGIC;
  signal      MODB : STD_LOGIC;
  signal      VCC : STD_LOGIC;
  signal      XTAL : STD_LOGIC;
  signal      RESET : STD_LOGIC;
  signal      N_1 : STD_LOGIC;

  component OR5
    Port (
      I1 : In    std_logic;
      I2 : In    std_logic;
      I3 : In    std_logic;
      I4 : In    std_logic;
      I5 : In    std_logic;
      O  : Out   std_logic );
  end component;

end architecture;
```

```

component RAM_F
  Port (
    ADR : In    std_logic_vector (7 downto 0);
    CE  : In    std_logic;
    OE  : In    std_logic;
    WE  : In    std_logic;
    D   : InOut std_logic_vector (7 downto 0) );
end component;

component LCD_DRIVER2
  Port (
    DATA : In    std_logic_vector (7 downto 0);
    DATAVAIL : In  std_logic;
    STROBE : In   std_logic;
    DISPLAY : InOut STRING(1 TO 25) );
end component;

component CRYSTAL4M
  Port (
    O : Out  std_logic );
end component;

component ANALOG_THERM2
Generic ( INTERVAL:TIME:=150 US );
  Port ( INPACTIVE : In  STD_LOGIC;
        O : Out  REAL );
end component;

component CONTROL
  Port (
    GND : Out  std_logic;
    MODA : Out  std_logic;
    MODB : Out  std_logic;
    RESET : Out  std_logic;
    VCC : Out  std_logic );
end component;

component AD_CON
Generic ( CONV_TIME:TIME:=10 NS;
        VHI:INTEGER:=5;
        ADBITS:INTEGER:=8;
        PER:TIME:=0.5 US );
  Port (
    ANLGIN : In  REAL;
    CLK : In  std_logic;
    RUN : In  std_logic;
    DGTOUT : Out  std_logic_vector (7 downto 0) );
end component;

component CONNECTER
  Port (
    I : In  std_logic_vector (7 downto 0);
    Z : Out  std_logic_vector (0 to 7) );
end component;

component INV
  Port (
    I : In  std_logic;
    O : Out  std_logic );
end component;

component P8255
  Port (
    A0 : In  std_logic;

```

```

        A1 : In    std_logic;
        CS : In    std_logic;
        RD : In    std_logic;
RESET : In    std_logic;
        WR : In    std_logic;
        D  : InOut std_logic_vector (7 downto 0);
        PA : InOut std_logic_vector (7 downto 0);
        PB : InOut std_logic_vector (7 downto 0);
        PC : InOut std_logic_vector (7 downto 0) );
end component;

component R2864
  Port (
    A : In    std_logic_vector (12 downto 0);
    CE : In    std_logic;
    OE : In    std_logic;
    WE : In    std_logic;
    IO : InOut std_logic_vector (7 downto 0) );
end component;

component HC573
  Port (
    D : In    std_logic_vector (7 downto 0);
    LE : In    std_logic;
    OE : In    std_logic;
    Y : Out   std_logic_vector (7 downto 0) );
end component;

component HC138
  Port (
    A : In    std_logic_vector (2 downto 0);
    G : In    std_logic;
    G1 : In   std_logic;
    G2 : In   std_logic;
    Y : Out   std_logic_vector (7 downto 0) );
end component;

component HC11A8
  Port (
    EXTAL : In    STD_LOGIC;
    IRQ : In    STD_LOGIC;
    MODB : In    STD_LOGIC;
    PA0 : In    STD_LOGIC;
    PA1 : In    STD_LOGIC;
    PA2 : In    STD_LOGIC;
    PE0 : In    STD_LOGIC;
    PE1 : In    STD_LOGIC;
    PE2 : In    STD_LOGIC;
    PE3 : In    STD_LOGIC;
    PE4 : In    STD_LOGIC;
    PE5 : In    STD_LOGIC;
    PE6 : In    STD_LOGIC;
    PE7 : In    STD_LOGIC;
    VRH : In    STD_LOGIC;
    VRL : In    STD_LOGIC;
    XIRQ : In   STD_LOGIC;
    A0 : InOut  STD_LOGIC;
    A1 : InOut  STD_LOGIC;
    A2 : InOut  STD_LOGIC;
    A3 : InOut  STD_LOGIC;
    A4 : InOut  STD_LOGIC;

```

```

        A5 : InOut STD_LOGIC;
        A6 : InOut STD_LOGIC;
        A7 : InOut STD_LOGIC;
        AS : InOut STD_LOGIC;
        MODA : InOut STD_LOGIC;
        PA7 : InOut STD_LOGIC;
        PD0 : InOut STD_LOGIC;
        PD1 : InOut STD_LOGIC;
        PD2 : InOut STD_LOGIC;
        PD3 : InOut STD_LOGIC;
        PD4 : InOut STD_LOGIC;
        PD5 : InOut STD_LOGIC;
        RESET : InOut STD_LOGIC;
        A10 : Out STD_LOGIC;
        A11 : Out STD_LOGIC;
        A12 : Out STD_LOGIC;
        A13 : Out STD_LOGIC;
        A14 : Out STD_LOGIC;
        A15 : Out STD_LOGIC;
        A8 : Out STD_LOGIC;
        A9 : Out STD_LOGIC;
        E : Out STD_LOGIC;
        PA3 : Out STD_LOGIC;
        PA4 : Out STD_LOGIC;
        PA5 : Out STD_LOGIC;
        PA6 : Out STD_LOGIC;
        RW : Out STD_LOGIC;
        XTAL : Out STD_LOGIC );
end component;

begin

I_23 : OR5
    Port Map ( I1=>R2864_A(12), I2=>R2864_A(11),
I3=>R2864_A(10), I4=>R2864_A(9), I5=>R2864_A(8), O=>N_2 );
I_22 : RAM_F
    Port Map ( ADR(7 downto 0)=>R2864_A(7 downto 0), CE=>N_2,
OE=>HC138_Y(3), WE=>HC138_Y(2), D(7 downto 0)=>AD(7 downto 0) );
I_19 : LCD_DRIVER2
    Port Map ( DATA(7 downto 0)=>PORTB(7 downto 0),
DATAvail=>PORTC(2), STROBE=>PORTC(1), DISPLAY=>DISPLAY );
I_18 : CRYSTAL4M
    Port Map ( O=>N_1 );
I_17 : ANALOG_THERM2
Generic Map ( INTERVAL=>150 US )
    Port Map ( INACTIVE=>PORTC(0), O=>T_ANALOG );
I_15 : CONTROL
    Port Map ( GND=>GND, MODA=>MODA, MODB=>MODB, RESET=>RESET, VCC=>VCC );
I_13 : AD_CON
Generic Map ( CONV_TIME=>10 NS, VHI=>5, ADBITS=>8, PER=>0.5 US )
    Port Map ( ANLGIN=>T_ANALOG, CLK=>E, RUN=>VCC,
DGTOUT(7 downto 0)=>PORTA(7 downto 0) );
I_11 : CONNECTER
    Port Map ( I(7 downto 0)=>AD(15 downto 8),
Z(0)=>R2864_A(8), Z(1)=>R2864_A(9), Z(2)=>R2864_A(10),
Z(3)=>R2864_A(11), Z(4)=>R2864_A(12), Z(5)=>HC138_A(1),
Z(6)=>HC138_A(2), Z(7)=>A15 );

```



```

I_9 : INV
  Port Map ( I=>RESET, O=>RESET_P );
I_10 : P8255
  Port Map ( A0=>R2864_A(0), A1=>R2864_A(1), CS=>GND,
RD=>HC138_Y(5),RESET=>RESET_P, WR=>HC138_Y(4),
          D(7 downto 0)=>AD(7 downto 0),
          PA(7 downto 0)=>PORTA(7 downto 0),
          PB(7 downto 0)=>PORTB(7 downto 0),
          PC(7 downto 0)=>PORTC(7 downto 0) );
I_8 : R2864
  Port Map ( A(12 downto 0)=>R2864_A(12 downto 0),
CE=>GND,OE=>HC138_Y(7), WE=>HC138_Y(6),IO(7 downto 0)=>AD(7 downto 0) );
I_7 : HC573
  Port Map ( D(7 downto 0)=>AD(7 downto 0), LE=>AS, OE=>GND,Y(7 downto
0)=>R2864_A(7 downto 0) );
I_6 : HC138
  Port Map ( A(2 downto 0)=>HC138_A(2 downto 0), G=>E, G1=>A15,G2=>A15,
Y(7 downto 0)=>HC138_Y(7 downto 0) );
I_4 : HC11A8
  Port Map ( EXTAL=>N_1, IRQ=>VCC, MODB=>MODB, PA0=>PA(0),
          PA1=>PA(1), PA2=>PA(2), PE0=>PE(0), PE1=>PE(1),PE2=>PE(2),
PE3=>PE(3), PE4=>PE(4), PE5=>PE(5),
PE6=>PE(6), PE7=>PE(7), VRH=>VCC, VRL=>GND, XIRQ=>VCC,
A0=>AD(0), A1=>AD(1), A2=>AD(2), A3=>AD(3), A4=>AD(4),
A5=>AD(5), A6=>AD(6), A7=>AD(7), AS=>AS, MODA=>MODA,
PA7=>PA(7), PD0=>PD(0), PD1=>PD(1), PD2=>PD(2),
PD3=>PD(3), PD4=>PD(4), PD5=>PD(5), RESET=>RESET,
A10=>AD(10), A11=>AD(11), A12=>AD(12), A13=>AD(13), A14=>AD(14), A15=>AD(15),
A8=>AD(8), A9=>AD(9), E=>E,
PA3=>PA(3), PA4=>PA(4), PA5=>PA(5), PA6=>PA(6), RW=>HC138_A(0), XTAL=>XTAL );

```

end SCHEMATIC;

configuration CFG_THERM9_SCHEMATIC of THERM9 is

for SCHEMATIC

for I_23: OR5

use configuration WORK.CFG_OR5_BEHAVIORAL;

end for;

for I_22: RAM_F

use configuration WORK.CFG_RAM_F_BEHAVIORAL;

end for;

for I_19: LCD_DRIVER2

use configuration WORK.CFG_LCD_DRIVER2_BEHAVIORAL;

end for;

for I_18: CRYSTAL4M

use configuration WORK.CFG_CRYSTAL4M_BEHAVIORAL;

end for;

for I_17: ANALOG_THERM2

use configuration WORK.CFG_ANALOG_THERM2_BEHAVIORAL;

end for;

for I_15: CONTROL

use configuration WORK.CFG_CONTROL_BEHAVIORAL;

end for;

for I_13: AD_CON

use configuration WORK.CFG_AD_CON_BEHAVIORAL;

end for;

for I_11: CONNECTER

use configuration WORK.CFG_CONNECTER_BEHAVIORAL;

```
end for;
for I_9: INV
  use configuration WORK.CFG_INV_BEHAVIORAL;
end for;
for I_10: P8255
  use configuration WORK.CFG_P8255_BEHAVIORAL;
end for;
for I_8: R2864
  use configuration WORK.CFG_R2864_BEHAVIORAL;
end for;
for I_7: HC573
  use configuration WORK.CFG_HC573_BEHAVIORAL;
end for;
for I_6: HC138
  use configuration WORK.CFG_HC138_BEHAVIORAL;
end for;
for I_4: HC11A8
  use configuration WORK.CFG_HC11A8_BEHAVIORAL;
end for;
end for;

end CFG_THERM9_SCHEMATIC;
```

C-2: MICROCONTROLLER

-- VHDL Model Created from SGE Symbol hc11a8.sym -- Apr 4 19:26:21 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

library SMARTMODEL;
use SMARTMODEL.COMPONENTS.ALL;

entity HC11A8 is
  Port (
    EXTAL : In    STD_LOGIC;
    IRQ   : In    STD_LOGIC;
    MODB  : In    STD_LOGIC;
    PA0   : In    STD_LOGIC;
    PA1   : In    STD_LOGIC;
    PA2   : In    STD_LOGIC;
    PE0   : In    STD_LOGIC;
    PE1   : In    STD_LOGIC;
    PE2   : In    STD_LOGIC;
    PE3   : In    STD_LOGIC;
    PE4   : In    STD_LOGIC;
    PE5   : In    STD_LOGIC;
    PE6   : In    STD_LOGIC;
    PE7   : In    STD_LOGIC;
    VRH   : In    STD_LOGIC;
    VRL   : In    STD_LOGIC;
    XIRQ  : In    STD_LOGIC;
    A0    : InOut STD_LOGIC;
    A1    : InOut STD_LOGIC;
    A2    : InOut STD_LOGIC;
    A3    : InOut STD_LOGIC;
    A4    : InOut STD_LOGIC;
    A5    : InOut STD_LOGIC;
    A6    : InOut STD_LOGIC;
    A7    : InOut STD_LOGIC;
    AS    : InOut STD_LOGIC;
    MODA  : InOut STD_LOGIC;
    PA7   : InOut STD_LOGIC;
    PD0   : InOut STD_LOGIC;
    PD1   : InOut STD_LOGIC;
    PD2   : InOut STD_LOGIC;
    PD3   : InOut STD_LOGIC;
    PD4   : InOut STD_LOGIC;
    PD5   : InOut STD_LOGIC;
    RESET : InOut STD_LOGIC;
    A10   : Out   STD_LOGIC;
    A11   : Out   STD_LOGIC;
    A12   : Out   STD_LOGIC;
    A13   : Out   STD_LOGIC;
```

```

        A14 : Out   STD_LOGIC;
        A15 : Out   STD_LOGIC;
        A8  : Out   STD_LOGIC;
        A9  : Out   STD_LOGIC;
        E   : Out   STD_LOGIC;
        PA3 : Out   STD_LOGIC;
        PA4 : Out   STD_LOGIC;
        PA5 : Out   STD_LOGIC;
        PA6 : Out   STD_LOGIC;
        RW  : Out   STD_LOGIC;
        XTAL : Out  STD_LOGIC );
end HC11A8;

architecture BEHAVIORAL of HC11A8 is

begin
    U1 : MC68HC11_52
        generic map (
            TimingVersion => "MC68HC11_52",
            DelayRange => "MAX",
            MemoryFile => "memory.mif",
            ModelMapVersion => "01003")
        port map(
            E=>E, EXTAL=>EXTAL, IRQ=>IRQ, MODA=>MODA, MODB=>MODB,
            PA0=>PA0, PA1=>PA1, PA2=>PA2, PA3=>PA3,
            PA4=>PA4, PA5=>PA5, PA6=>PA6, PA7=>PA7,
            PB0=>A8, PB1=>A9, PB2=>A10, PB3=>A11,
            PB4=>A12, PB5=>A13, PB6=>A14, PB7=>A15,
            PC0=>A0, PC1=>A1, PC2=>A2, PC3=>A3,
            PC4=>A4, PC5=>A5, PC6=>A6, PC7=>A7,
            PD0=>PD0, PD1=>PD1, PD2=>PD2, PD3=>PD3, PD4=>PD4, PD5=>PD5,
            PE0=>PE0, PE1=>PE1, PE2=>PE2, PE3=>PE3,
            PE4=>PE4, PE5=>PE5, PE6=>PE6, PE7=>PE7,
            RESET=>RESET, STRA=>AS, STRB=>RW, VRH=>VRH,
            VRL=>VRL, XIRQ=>XIRQ, XTAL=>XTAL );
end BEHAVIORAL;

configuration CFG_HC11A8_BEHAVIORAL of HC11A8 is
    for BEHAVIORAL
        for U1: MC68HC11_52
            use entity SMARTMODEL.MC68HC11_52(SMARTMODEL);
        end for;
    end for;
end CFG_HC11A8_BEHAVIORAL;

```

C-3: *EEPROM*

-- VHDL Model Created from SGE Symbol r2864.sym -- Jun 20 19:27:48 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

library SMARTMODEL;
use SMARTMODEL.COMPONENTS.ALL;

entity R2864 is
  Port (
    A : In    std_logic_vector (12 downto 0);
    CE : In   std_logic;
    OE : In   std_logic;
    WE : In   std_logic;
    IO : InOut std_logic_vector (7 downto 0) );
end R2864;

architecture BEHAVIORAL of R2864 is

begin
  U1: x2864
    generic map(TimingVersion => "X2864A",
               DelayRange => "MAX",
               MemoryFile => "rom.mif",
               ModelMapVersion => "01003")
    port map(
A(0),A(1),A(2),A(3),A(4),A(5),A(6),A(7),A(8),A(9),A(10),A(11),A(12),
    CE,
    IO(0),IO(1),IO(2),IO(3),IO(4),IO(5),IO(6),IO(7),
    OE,WE );

end BEHAVIORAL;

configuration CFG_R2864_BEHAVIORAL of R2864 is
  for BEHAVIORAL
    for U1: x2864
      use entity SMARTMODEL.X2864(SMARTMODEL);
    end for;
  end for;

end CFG_R2864_BEHAVIORAL;
```

C-4: 8255 PROGRAMMABLE PERIPHERAL INTERFACE

-- VHDL Model Created from SGE Symbol p8255.sym -- Apr 4 17:24:58 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

  library SMARTMODEL;
  use SMARTMODEL.COMPONENTS.ALL;

entity P8255 is
  Port (
    A0 : In    std_logic;
    A1 : In    std_logic;
    CS : In    std_logic;
    RD : In    std_logic;
    RESET : In  std_logic;
    WR : In    std_logic;
    D  : InOut std_logic_vector (7 downto 0);
    PA : InOut std_logic_vector (7 downto 0);
    PB : InOut std_logic_vector (7 downto 0);
    PC : InOut std_logic_vector (7 downto 0) );
end P8255;

architecture BEHAVIORAL of P8255 is
begin
  U1: i8255a
    generic map(
      TimingVersion => "I8255A",
      DelayRange    => "MAX",
      ModelMapVersion => "01003")
    port map(
      A0=>A0,      A1=>A1,      CS=>CS,
      D0=>D(0), D1=>D(1), D2=>D(2), D3=>D(3),
      D4=>D(4), D5=>D(5), D6=>D(6), D7=>D(7),
      PA0=>PA(0), PA1=>PA(1), PA2=>PA(2), PA3=>PA(3),
      PA4=>PA(4), PA5=>PA(5), PA6=>PA(6), PA7=>PA(7),
      PB0=>PB(0), PB1=>PB(1), PB2=>PB(2), PB3=>PB(3),
      PB4=>PB(4), PB5=>PB(5), PB6=>PB(6), PB7=>PB(7),
      PC0=>PC(0), PC1=>PC(1), PC2=>PC(2), PC3=>PC(3),
      PC4=>PC(4), PC5=>PC(5), PC6=>PC(6), PC7=>PC(7),
      RD =>RD,      RESET =>RESET, WR =>WR);
end BEHAVIORAL;

configuration CFG_P8255_BEHAVIORAL of P8255 is
  for BEHAVIORAL
    for U1: I8255A
      use entity SMARTMODEL.I8255A(SMARTMODEL);
    end for;
  end for;
end CFG_P8255_BEHAVIORAL;
```

C-5: HC138 DECODER

-- VHDL Model Created from SGE Symbol hc138.sym -- Mar 17 10:35:31 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

library SMARTMODEL;
use SMARTMODEL.COMPONENTS.ALL;

entity HC138 is
  Port (
    A : In    std_logic_vector (2 downto 0);
    G : In    std_logic;
    G1 : In   std_logic; -- active low
    G2 : In   std_logic; -- active low
    Y : Out   std_logic_vector (7 downto 0) );
end HC138;

architecture BEHAVIORAL of HC138 is
begin
  U1: ttl138
  generic map(
    TimingVersion => "SN74AS138",
    DelayRange => "MAX",
    ModelMapVersion => "01003")
  port map(
    A(0),A(1),A(2),
    G,G1,G2,
    Y(0),Y(1),Y(2),Y(3),Y(4),Y(5),Y(6),Y(7));

end BEHAVIORAL;

configuration CFG_HC138_BEHAVIORAL of HC138 is
  for BEHAVIORAL
    for U1: ttl138
      use entity SMARTMODEL.ttl138(SMARTMODEL);
    end for;
  end for;

end CFG_HC138_BEHAVIORAL;
```

C-6: HC573 LATCH

```
-- VHDL Model Created from SGE Symbol hc573.sym -- Mar 19 11:02:20 1998

library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

library SMARTMODEL;
use SMARTMODEL.COMPONENTS.ALL;

entity HC573 is
  Port (
    D : In    std_logic_vector (7 downto 0);
    LE : In    std_logic;
    OE : In    std_logic;
    Y : Out   std_logic_vector (7 downto 0) );
end HC573;

architecture BEHAVIORAL of HC573 is

begin
  U1: ttl573
  generic map(
    TimingVersion => "SN74AS573",
    DelayRange => "MAX",
    ModelMapVersion => "01003")
  port map(
    D(0),D(1),D(2),D(3),D(4),D(5),D(6),D(7),
    LE,OE,
    Y(0),Y(1),Y(2),Y(3),Y(4),Y(5),Y(6),Y(7) );
end BEHAVIORAL;

configuration CFG_HC573_BEHAVIORAL of HC573 is
  for BEHAVIORAL
    for U1: ttl573
      use entity SMARTMODEL.ttl573(SMARTMODEL);
    end for;
  end for;
end CFG_HC573_BEHAVIORAL;
```


C-7: EXTERNAL RAM

-- VHDL Model Created from SGE Symbol ram_f.sym -- Jun 23 23:05:43 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity RAM_F is
  Port (
    ADR : In    std_logic_vector (7 downto 0);
    CE  : In    std_logic;
    OE  : In    std_logic;
    WE  : In    std_logic;
    D   : InOut std_logic_vector (7 downto 0) );
end RAM_F;

architecture BEHAVIORAL of RAM_F is

  function INTVAL(VAL: STD_LOGIC_VECTOR)
    return INTEGER is
    variable VALV: std_logic_vector(val'length-1 downto 0);
    variable sum:integer := 0;
  begin
    VALV := VAL;
    for N in VALV'low to VALV'high loop
      if VALV(N) = '1' then
        SUM := SUM + (2**N);
      end if;
    end loop;
    return SUM;
  end INTVAL;

  type MEMORY is array(0 to 255) of std_logic_vector(7 downto 0);
  signal MEM:MEMORY;      -- In initial state, contents are unknown

begin

  process

  variable K:integer;
  begin

  wait until CE'event or OE'event or WE'event;

  if CE = '0' then

    if OE = '0' then
      K := intval(adr);
      D <= MEM(K);-- after 50 ns;    -- tOE = 55 ns for X28HC64
      wait until D'event;
    elsif WE = '0' then
      wait until D'event;
      K := intval(adr);
    end if;
  end if;
end process;
end BEHAVIORAL;
```

```
MEM(K) <= D; --after 1 us;    -- tDV = 1 us  for X28HC64

else
  D <= "ZZZZZZZZ";
end if;
else
  D <= "ZZZZZZZZ" ;
end if;

end process;

end BEHAVIORAL;

configuration CFG_RAM_F_BEHAVIORAL of RAM_F is
  for BEHAVIORAL

    end for;

end CFG_RAM_F_BEHAVIORAL;
```

C-8: EXTERNAL RAM WITH FAULTS INJECTED

Note : Listing of the file with all faults introduced is shown below. While simulating, only one fault was injected at a time by commenting out the code which introduced other faults

```
-- VHDL Model Created from SGE Symbol ram_f.sym -- Jun 23 23:05:43 1998
```

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity RAM_F is
  Port (
    ADR : In    std_logic_vector (7 downto 0);
    CE  : In    std_logic;
    OE  : In    std_logic;
    WE  : In    std_logic;
    D   : InOut std_logic_vector (7 downto 0) );
end RAM_F;

architecture BEHAVIORAL of RAM_F is

  function INTVAL(VAL: STD_LOGIC_VECTOR)
    return INTEGER is
    variable VALV: std_logic_vector(val'length-1 downto 0);
    variable sum:integer := 0;
  begin
    VALV := VAL;
    for N in VALV'low to VALV'high loop
      if VALV(N) = '1' then
        SUM := SUM + (2**N);
      end if;
    end loop;
    return SUM;
  end INTVAL;

  type MEMORY is array(0 to 255) of std_logic_vector(7 downto 0);
  signal MEM:MEMORY;      -- In initial state, contents are unknown

begin

process

variable K:integer;
begin

wait until CE'event or OE'event or WE'event;

if CE = '0' then

  if OE = '0' then
```

```

K := intval(adr);
  if K = 32 then      -- Address decoder faults 1+2
    null;
  if K = 45 then      -- Address decoder faults 3+4
    D <= MEM(K) and MEM(08);
  if K = 13 then      -- Address decoder faults 1+3
    D <= MEM(K) and MEM(71);
  elsif K = 71 then
    null;
  if (K = 148) or (K = 77) then
    D <= MEM(77);

  else --if K /= 71 then
    D <= MEM(K);-- after 50 ns;  -- tOE = 55 ns for X28HC64
  end if;
  wait until D'event;
elsif WE = '0' then
  wait until D'event;
  K := intval(adr);
  --Introducing stuck at 0 fault at bit 3 of location 10
  if K = 10 then
    MEM(K) <= (D and "11110111");-- after 1 us;
  --Introducing stuck at 1 fault at bit 6 of location 245
  elsif K = 245 then
    MEM(K) <= (D or "01000000") after 1 us;
  --Introducing 0 to 1 transition fault in bit 5 of location 62
  if K = 62 then
    if (MEM(K) and "00100000") = "00000000" then
      MEM(K) <= D and "11011111";
    else
      MEM(K) <= D;
    end if;
  --Introducing 1 to 0 transition fault in bit 2 of location 113
  if K = 113 then
    if (MEM(K) and "00000100") = "00000100" then
      MEM(K) <= D or "00000100";
    else MEM(K) <= D;
    end if;
  --Introducing idempotent coupling fault between cells of different
  --bytes(20 and 40)
  --A transition in bit 6 of loc. 20 causes bit 6 of location 40 to
  --become 1
  if K = 20 then
    MEM(K) <= D ;--after 1 us;
    MEM(40) <= MEM(40) or "01000000" ;--after 1 us
  --Introducing inversion coupling fault between cells of different
  --bytes(15 and 35)
  --A transition in any bit of loc. 35 causes the bit 4 of location 15
  --to be inverted
  if K = 35 then
    MEM(K) <= D;
    MEM(15) <= MEM(15) or ((MEM(15) and "00010000") xor "00010000");

  -- Introducing address decoder faults
  -- Fault 1+2: With address of 32, no location is accessed

  if K = 32 then

```

```

        null;
-- Fault 3+4: With address of 45 locations 45 and 08 are accessed
-- simultaneously
--           Location 08 is also accessed when address 08 is applied
    if K = 45 then
        MEM(K) <= D;
        MEM(08) <= D;
--Fault 1+3: With address of 13, locations 13 and 71 are accessed,
--           but location 71 is not accessed when address 71 is
--           applied
    if K = 13 then
        MEM(K) <= D;
        MEM(71) <= D;
    elsif K = 71 then
        null;
--Fault 2+4: With address of 148 or 77, location 77 is accessed,
-- so location 148 is never accessed
    if (K = 148) or (K = 77) then
        MEM(77) <= D;

        else -- K /= 71 then
            MEM(K) <= D; --after 1 us;    -- tDV = 1 us for X28HC64
        end if;
    else
        D <= "ZZZZZZZZ";
    end if;
else
    D <= "ZZZZZZZZ" ;
end if;

end process;

end BEHAVIORAL;

configuration CFG_RAM_F_BEHAVIORAL of RAM_F is
    for BEHAVIORAL

        end for;

end CFG_RAM_F_BEHAVIORAL;

```

C-9: ANALOG TO DIGITAL CONVERTER

-- VHDL Model Created from SGE Symbol ad_con.sym -- Apr 14 09:33:51 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity AD_CON is
  Generic ( CONV_TIME:TIME:=10 NS;
            VHI:INTEGER:=5;
            ADBITS:INTEGER:=8;
            PER:TIME:=0.5 US );
  Port (  ANLGIN : In    REAL;
          CLK   : In    std_logic;
          RUN   : In    std_logic;
          DGTOUT : Out  std_logic_vector (7 downto 0) );
end AD_CON;

architecture BEHAVIORAL of AD_CON is

function A2D(X : real)
  return integer is
  variable Y: integer := 0;
  variable W: integer := 0;
  variable Z: real    := 0.0 ;
  constant RESOLUTION : real := real(VHI)/real(2**ADBITS);
begin

  while ((X - Z) > 0.0 ) loop
    Z := real(Y) * RESOLUTION - RESOLUTION/2.0;
    -- The -ve term is included here
    -- to make error +- 1/2 LSB
    Y := Y + 1;
  end loop;
  if (Y=0) then
    W := 0;
  elsif (Y=258) then
    W := 255;
  else
    W := Y - 2;
  end if;
  return W;
end A2D;

begin

process(CLK)  -- Modeling Continuous scan mode of ADC of HC11
begin
  if CLK'event and CLK = '1' and RUN = '1' then
    DGTOUT <= CONV_STD_LOGIC_VECTOR(a2d(ANLGIN),8) after CONV_TIME;
  end if;
end process;
end architecture;
```

```
end process;  
end BEHAVIORAL;  
  
configuration CFG_AD_CON_BEHAVIORAL of AD_CON is  
  for BEHAVIORAL  
  
    end for;  
  
end CFG_AD_CON_BEHAVIORAL;
```

C-10: LCD DRIVER

-- VHDL Model Created from SGE Symbol lcd_driver2.sym -- Jul 3 17:34:18 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity LCD_DRIVER2 is
-- actually an output signal, declared inout since we want to
-- monitor the output at a certain point in the program
  Port ( DATA : In    std_logic_vector (7 downto 0);
        DATAVAIL : In    std_logic;
        STROBE : In    std_logic;
        DISPLAY : InOut STRING(1 TO 25) );
end LCD_DRIVER2;

architecture BEHAVIORAL of LCD_DRIVER2 is

  begin

    process(STROBE,DATAVAIL)

      variable int_data1: integer;
      variable TEMPSTRING :string(1 to 25):= "          ";
      variable n:integer:=1;

      begin

        if DATAVAIL = '0' and DATAVAIL'last_value = '1' then      -- DATAVAIL --
is portc(2) and it indicates that
-- microcontroller is ready to send data
-- When it goes low, it means the sequence of
-- characters is finished, and then it sends
-- this sequence to the output
          DISPLAY <=TEMPSTRING;
          TEMPSTRING := "          ";
          n := 1;

        elsif DATAVAIL = '1' then
          if STROBE'event and STROBE = '1' then -- STROBE is portc(1), -- ---
whenever its rising edge comes,
-- LCD driver accepts the ASCII data
            int_data1 := conv_integer(unsigned(DATA));
            tempstring(n) := character'val(int_data1);
            n := n+1;
          end if;
        end if;

      end process;

    end architecture;
```



```
end BEHAVIORAL;  
  
configuration CFG_LCD_DRIVER2_BEHAVIORAL of LCD_DRIVER2 is  
  for BEHAVIORAL  
  
    end for;  
  
end CFG_LCD_DRIVER2_BEHAVIORAL;
```

C-11: CRYSTAL

-- VHDL Model Created from SGE Symbol crystal4m.sym -- Apr 30 14:10:04 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity CRYSTAL4M is
  Port (      O : Out   std_logic );
end CRYSTAL4M;

architecture BEHAVIORAL of CRYSTAL4M is

begin
  -- External Clock Input 4MHz, 4 time higher then E clock, 1MHz
  p0 : process
  begin
    O <= '0';
  wait for 125000 ps;          --4 MHz
    O <= '1';
  wait for 125000 ps;          --4 MHz
  end process;
end BEHAVIORAL;

configuration CFG_CRYSTAL4M_BEHAVIORAL of CRYSTAL4M is
  for BEHAVIORAL

    end for;

end CFG_CRYSTAL4M_BEHAVIORAL;
```

C-12: ANALOG THERM2

```
-- VHDL Model Created from SGE Symbol analog_therm2.sym -- May 31 18:09:40  
1998
```

```
library IEEE;  
  use IEEE.std_logic_1164.all;  
  use IEEE.std_logic_misc.all;  
  use IEEE.std_logic_arith.all;  
  use IEEE.std_logic_components.all;  
  use STD.TEXTIO.all;  
  
entity ANALOG_THERM2 is  
  
  Generic ( INTERVAL:TIME:=150 US );  
  Port ( INPACTIVE : In    STD_LOGIC;  
        O : Out    REAL );  
end ANALOG_THERM2;  
  
architecture BEHAVIORAL of ANALOG_THERM2 is  
  
begin  
process(INPACTIVE)  
  variable TLINE: LINE;  
  variable T: REAL;  
begin  
if INPACTIVE'event and INPACTIVE = '1' then  
  READLINE(INPUT, TLINE);  
  READ(TLINE, T);  
  O <= T;  
end if;  
end process;  
  
end BEHAVIORAL;  
  
configuration CFG_ANALOG_THERM2_BEHAVIORAL of ANALOG_THERM2 is  
  for BEHAVIORAL  
  
    end for;  
  
end CFG_ANALOG_THERM2_BEHAVIORAL;
```

C-13: CONNECTOR

-- VHDL Model Created from SGE Symbol connector.sym -- Apr 6 21:02:20 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity CONNECTER is
  Port (      I : In    std_logic_vector (7 downto 0);
          Z : Out    std_logic_vector (0 to 7) );
end CONNECTER;

architecture BEHAVIORAL of CONNECTER is

begin
  Z(0) <= I(0);
  Z(1) <= I(1);
  Z(2) <= I(2);
  Z(3) <= I(3);
  Z(4) <= I(4);
  Z(5) <= I(5);
  Z(6) <= I(6);
  Z(7) <= I(7);
end BEHAVIORAL;

configuration CFG_CONNECTER_BEHAVIORAL of CONNECTER is
  for BEHAVIORAL

    end for;

end CFG_CONNECTER_BEHAVIORAL;
```

C-14: INVERTER

-- VHDL Model Created from SGE Symbol inv.sym -- Apr 2 11:30:24 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

  library SMARTMODEL;
  use SMARTMODEL.COMPONENTS.ALL;

entity INV is
  Port (      I : In    std_logic;
          O : Out    std_logic );
end INV;

architecture BEHAVIORAL of INV is

begin
  U1: ttl04
  generic map(
    TimingVersion => "SN74AS04",
    DelayRange => "MAX",
    ModelMapVersion => "01003")
  port map( I,O);

end BEHAVIORAL;

configuration CFG_INV_BEHAVIORAL of INV is
  for BEHAVIORAL
    for U1:ttl04
      use entity SMARTMODEL.ttl04(SMARTMODEL);
    end for;
  end for;

end CFG_INV_BEHAVIORAL;
```

C-15: OR GATE

-- VHDL Model Created from SGE Symbol or5.sym -- Jun 24 14:13:10 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity OR5 is
  Port (
    I1 : In    std_logic;
    I2 : In    std_logic;
    I3 : In    std_logic;
    I4 : In    std_logic;
    I5 : In    std_logic;
    O  : Out   std_logic );
end OR5;

architecture BEHAVIORAL of OR5 is

  begin

    process(I1,I2,I3,I4,I5)

      begin

        O <= (I1 or I2 or I3 or I4 or I5) after 5 ns;

      end process;

    end BEHAVIORAL;

  configuration CFG_OR5_BEHAVIORAL of OR5 is
    for BEHAVIORAL

      end for;

    end CFG_OR5_BEHAVIORAL;
```

C-16: CONTROL

-- VHDL Model Created from SGE Symbol control.sym -- Jun 28 23:29:36 1998

```
library IEEE;
  use IEEE.std_logic_1164.all;
  use IEEE.std_logic_misc.all;
  use IEEE.std_logic_arith.all;
  use IEEE.std_logic_components.all;

entity CONTROL is
  Port (
    GND : Out   std_logic;
    MODA : Out  std_logic;
    MODB : Out  std_logic;
    RESET : Out std_logic;
    VCC : Out   std_logic );
end CONTROL;

architecture BEHAVIORAL of CONTROL is
begin
  P1 : process
  begin
    RESET <= '1' after 0 ps,
            '0' after 6000000 ps,
            '1' after 10000000 ps; --release after 20 E
                                     --cycles

    MODA <= '1';
    MODB <= '1';

    VCC <= '1';
    GND <= '0';
    wait;
  end process;
end BEHAVIORAL;

configuration CFG_CONTROL_BEHAVIORAL of CONTROL is
  for BEHAVIORAL
    end for;
end CFG_CONTROL_BEHAVIORAL;
```

C-17: SIMULATION CONTROL FILE

```
open -s temp_win
echo $cwr > temp_win
monitor -n mon -o temp_win active i_19/display
monitor -s write tempstring
trace PORTA
trace PORTB
trace DISPLAY
trace T_ANALOG
trace E
trace PORTC(0)
trace PORTC(1)
trace PORTC(2)
trace AD
trace HC138_A(0)
trace HC138_Y(3)
trace HC138_Y(2)
trace N_3
trace /therm9/i_22/MEM
```