```
;Toggling PT5 to sound the buzzer for Dragon12 Plus Trainer Board
;PT5 of PORTT is connected to buzzer/speaker on Dragon12+ board
;This program toggles PT5 to sound the buzzer. Change the delay size to get a different sound
;See Chapter 4 of Mazidi&Causey HCS12 book

;Make sure you are in HCS12 Serial Monitor Mode before downloading
;and also make sure SW7=LOAD (SW7 is 2-bit red DIP Switch on bottom right side of the board and must be 00, or LOAD)
;Press F7 (to Make), then F5(Debug) to downLOAD,and F5 once more to start the program execution

;-------------------------------------------------
; Export Symbols
; KEEP THIS!!
;-------------------------------------------------
        XDEF    Entry       ; export 'Entry' symbol
        ABSENTRY  Entry     ; for absolute assembly: mark this as application entry point
;-------------------------------------------------
; Derivative-Specific Definitions
; KEEP THIS!!
;-------------------------------------------------
        INCLUDE 'mc9s12dp256.inc'    ;CPU used by Dragon12+ board
;-------------------------------------------------
; Constants Section
; KEEP THIS!!
;-------------------------------------------------
ROM     EQU    $0400
DATA    EQU    $1000
PROG    EQU    $2000
```

```
;USE $1000-$2FFF for Scratch Pad
R1      EQU    $1001
R2      EQU    $1002
R3      EQU    $1003
;---------------------------------------------------
; Variable/Data Section
; KEEP THIS!!
;---------------------------------------------------

;---------------------------------------------------
; Code Section
; KEEP THIS!!
;---------------------------------------------------
      ORG    PROG    ;Flash ROM address for Dragon12+
Entry:
            LDS    #$2000   ;Stack
            BSR    INIT
      BSET   DDRT,%00100000    ;PTT5 as Output pin for buzzer

;-------Sound the Buzzer at PTT5

BACK:
      LDAB   PTH
      COMB
      CMPB   #1
      BEQ    LIGHT_1
      BRA    SKIP1
LIGHT_1:
      STAB   PORTB
```

```
        BSET    PTT,%00100000     ;PTT5=1
                BSR     DELAY
                BCLR    PTT,%00100000     ;PTT5=0
                BSR     DELAY
SKIP1:
        LDAB    #0
        STAB    PORTB
                BRA     BACK            ;Keep toggling buzzer

;---------------------------------------------------
; Delay Subroutine
;---------------------------------------------------
DELAY:

        PSHA                    ;Save Reg A on Stack
        LDAA    #9              ;Change this value to hear
        STAA    R3              ;different Buzzer sounds
;--1 msec delay. The Serial Monitor works at speed of 48MHz with XTAL=8MHz on Dragon12+ board
;Freq. for Instruction Clock Cycle is 24MHz (1/2 of 48Mhz).
;(1/24MHz) x 10 Clk x240x10=1 msec. Overheads are excluded in this calculation.
L3:
        LDAA    #1
        STAA    R2
L2:
        LDAA    #240
        STAA    R1
L1:
        NOP         ;1 Intruction Clk Cycle
        NOP         ;1
```

```
        NOP       ;1
        DEC    R1  ;4
        BNE    L1  ;3
        DEC    R2  ;Total Instr.Clk=10
        BNE    L2
        DEC    R3
        BNE    L3

        PULA                        ;Restore Reg A
        RTS

;---------------------------------------------------
; Init Subroutine
;---------------------------------------------------
INIT:
        ; Disable 7-Segment Display
        BSET   DDRP,#$0F   ; Set Port P pins 0-3 to output
        BSET   PTP, #$0F    ; Disable 7-Segment Display

        ; LED
        BSET   DDRB,$FF
        BSET   DDRJ,$02
        BCLR   PTJ,$02

        ; PBs
        BCLR   DDRH,$0F
        BCLR   PTH,$0F

        RTS
```

```
;*************************************************************
;*              Interrupt Vectors                    *
;*************************************************************
        ORG   $3E7E
        DC.W  Entry     ;Reset Vector. CPU wakes here and it is sent to start of the code at $4000
;-------------------------------------------------
; End program
; KEEP THIS!!
;-------------------------------------------------
FINISH:
    NOP
       END
```