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; NTSC Video output

        list p=16f84, f=inhx8m
        include <P16F84.INC>


#define BANK0   bcf     STATUS, RP0             ; Switches banks
#define BANK1   bsf     STATUS, RP0
#define dnop    goto    $+1

temp            EQU     0x0C
temp2           EQU     0x0D
state           EQU     0x0E

interlace       EQU     1

        org 0
        BANK1
        clrf    TRISA
        clrf    TRISB
        BANK0
        clrf    PORTB
        clrf    PORTA
        bcf     state, interlace

FrameLoop

; Step one: Generate 3 lines of vertical interval
        call    vertserr
        call    vertserr
        call    vertserr
        call    vertserr
        call    vertserr
        call    vertserr
; Step two: Generate 3 lines of equalization pulses
        call    eqpulse
        call    eqpulse
        call    eqpulse
        call    eqpulse
        call    eqpulse
        call    eqpulse
; Step three: generate 10 black(nothing there) lines
        movlw   .10
        movwf   temp2
VLoopB
        call    blackline
        decfsz  temp2, f
         goto   VLoopB
; Step four: Generate 243 video lines
        movlw   .121
        movwf   temp2
VLoopC
        call    blackline
        decfsz  temp2, f
         goto   VLoopC


        movlw   .121
        movwf   temp2
VLoop
        call    blankline
        decfsz  temp2, f
         goto   VLoop
```

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        call    blankline
; Step five: generate half line if even
        dnop
;       btfss   state, interlace
;        call   halfline

; Step six: wait out the front porch of the last horz line (since we are calling eq pulse)
        dnop
        dnop

; Step seven: generate 3 lines of eq pulses
        call    eqpulse
        call    eqpulse
        call    eqpulse
        call    eqpulse
        call    eqpulse
        call    eqpulse
        goto    FrameLoop


; blankline: Call this from a loop without any loss of timing
; call one after another with 3 cycle delay in between
blankline                       ;141
        call    hsync           ;159
                                ;12
        bsf     PORTB, 0        ;    video is ON
; delay for 120 cycles
        movlw   .40
        movwf   temp
Loopbl
        decfsz  temp, f
         goto   Loopbl
                                ;133
        bcf     PORTB, 0        ;134
        return                  ;136

        ; decfsz xxx             137
        ; goto xxx               139

; blackline: Call this to get a completely black line
blackline
        call    hsync
        movlw   .40
        movwf   temp
Loopbk
        decfsz  temp, f
         goto   Loopbk
        dnop
        return


; halfline: generate half line of video
halfline                        ;61
        call    hsync           ;79
                                ;12
        bsf     PORTB, 0        ;    video is ON
; delay for 40
        movlw   10
        movwf   temp
Loophl
        nop
        decfsz  temp, f
         goto   Loophl
                                ;53
        bcf     PORTB, 0        ;54
```

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        return                  ;56

        ; decfsz xxx             57
        ; goto xxx              59

; eqpulse: generates the equalizing pulse
eqpulse
        bcf     PORTA, 0        ; Pulse is 2.8uS wide
        dnop
        dnop
        dnop
        nop
        bsf     PORTA, 0        ; 1
        movlw   .22             ; 2
        movwf   temp            ; 3
loopeq
        decfsz  temp, f
         goto   loopeq          ; 69
        return                  ; 71

        ; call  eqpulse         ; 73

; vertser: generates the serration
vertserr
        bcf     PORTA, 0        ; 1
        movlw   .21             ; 2
        movwf   temp            ; 3
loopser
        decfsz  temp, f
         goto   loopser         ; 66
        dnop                    ; 68
        bsf     PORTA, 0
        dnop                    ; 2
        dnop                    ; 4
        dnop                    ; 6
        dnop                    ; 8
        return                  ; 10

        ; call vertserr         ; 12




; hsync: Generates the horizontal sync tip, and also the front and back porch.
; 12 instruction cycles from sync hi to return. 18 from call to sync hi.
hsync                                                                   ;2
        dnop                    ; H Front porch is 1.6 ms, so wait 4 cycles(2 thru call);4
        bcf     PORTA, 0        ; HSync width is 4.8 ms, so wait 12 cycles              ;5
        dnop                                                                            ;7
        dnop                                                                            ;9
        dnop                                                                            ;11
        dnop                                                                            ;13
        dnop                                                                            ;15
        dnop                                                                            ;17
        bsf     PORTA, 0        ; H Back Porch is 4.8 ms, so wait 12 cycles             ;18
        dnop                                                                            ;20
        dnop                                                                            ;22
        dnop                                                                            ;24
        dnop                                                                            ;26
        dnop                                                                            ;28
        return                  ; Return is 2 cycles                                    ;30
```

```
end
```