- **Table read** : PM → Latch → DM

      TBLRD *+
      MOVF TABLAT, W
      MOVWF POSTINC0

- **Delay 計算** : clock period = 1 μs, 欲 delay 100 μs

      MOVLW : 1 cycle ⎤
      MOVWF : 1 cycle ⎥   1 inst. cycle = 4 clock period = 4 μs
      DECF : 1 cycle ⎥   100 ÷ 4 = 25 個 inst. cycle
      BNZ : 2/1 cycle ⎦   1+1+ $\underline{(1+2)\times(count-1)+(1+1)}$ = 25 ⇒ count = 8
          有 branch   ↳ loop 部份   ↳ ∴ MOVLW D'8'

- **Delay 計算** : 1MHz PIC18F

      DELAY   MOVLW D'100'   1   ⎤   clock cycle = $\frac{1}{1M}$ = 1 μs
              MOVWF 0x20   1   ⎥   1 inst. cycle = 4 clock cycle = 4 μs
      Loop   DECFSZ 0x20, F   1   ⎥
              BRA Loop   1/2 ⎥   1+1 + (1+1)×99 + (1+2)×1 + 1 = 203 個 inst. cycle
              RETURN   1   ⎦   delay = 203 × 4 = 812 μs

- **點亮 LED (portL bit7)**

      BCF TRISL, TRISL7 // output
      BSF PORTL, RL7

- **七段顯示器 (令 0~9 分別在 0x100 ~ 0x109), 且 portA 的 0-3 bit 為開關**

      MOVLW 0x0F
      MOVWF ADCON1 // portA、B、E為 digital IO
      CLRF TRISB // port 為 output
      LFSR 0 0x100
  Loop :
      MOVF PORTA, W
      ANDLW B'00001111' // 取後 4 bit
      MOVFF PLUSW0, PORTB // portB = [0x100 + WREG]
      BRA Loop

- **Polled IO**

  Begin:
  ```
      BCF  PORTD, RD0  // turn off LED
      BTFSS PORTB, RB0 // check RB0是否為1, skip if 1, 否則就 polled IO
          BRA Begin
  ```

- **Interrupt IO (INT0)**:   ✦ INT0 必為 high priority

  ┌───┐
  │ ① 先清空 flag bit (INTxIF)   BCF INTCON, INT0IF   │
  │ ② 設 enable bit 為 1 (INTxIE) BSF INTCON, INT0IE   │
  │ ③ 設 GIE bit 為 1   BSF INTCON, GIE   │
  │ ④ ADCON1 設成 0x0F   MOVLW 0x0F   │
  │   MOVWF ADCON1   │
  └───┘

  ```
      org  0x00
      GOTO  initial
  ```

  ┌──────────────────────┐   ┌──────────────────────────┐
  │ ISR: │   │ Interrupt: │
  │   org 0x0B   │   │   ⎰   │
  │   RCALL Interrupt │   │   BCF INTCON, INT0IF   │
  │   RETFIE   │   │   RETURN   │
  └──────────────────────┘   └──────────────────────────┘

  ```
  initial:
      ⎰
  ```

- **Timer (timer0)**

  ```
    BCF  INTCON, TMR0IF
    BSF  INTCON, TMR0IE
    BSF  INTCON, PEIE
    BSF  INTCON, GIE
    MOVLW _____
    MOVWF TMR0H
    MOVLW _____
    MOVWF TMR0L
    MOVLW b'00000100' // prescalar
    MOVWF T0CON
    BSF  T0CON, TMR0ON
  ```

- **timer delay 計算**:

  $$delay = inst.\ cycle \times prescaler \times \underline{count} \quad \Rightarrow Timer\ 0,1,3$$
  $$\hookrightarrow 65535 - x + 1$$
  $$\rightarrow 55 - x + 1$$

  $$delay = inst.\ cycle \times prescaler \times postscaler \times \underline{count}$$
  $$\hookrightarrow PR_2 + 1$$

- **ADC**:

  T_{AD}: 做一次 ADC 轉換所需的時間 ⩾ 0.7 μs

  T_{acq}: ⩾ 2.4 μs

- **ADC polled**

      BSF ADCON0, GO
  CONV: BTFSC ADCON0, GO
          BRA CONV

- **ADC interrupt**

    BSF PIE, ADIE
    BCF PIR1, ADIF
    BSF INTCON, PEIE
    BSF INTCON, GIE
    BSF ADCON0, GO ⇒ 好了會自動變0
                  (要自己再開)

- ADC 數值算電壓 ex: 200 (8bit 解析)

  $$\frac{255}{5-0} = 51$$

  $200 \div 51 = 3 \cdots 47$

  $47 \div 51 \times 10 = 9 \cdots \sim$ $\Big) ⇒ 3.9V$

- **Capture mode**：用來測未知訊號的 pulse width ⇒ CCPR 從 0 開始數
- **Compare mode**：timer1H、timer1L 數到 CCPR1H：CCPR1L 時 output 訊號
- **PWM mode**：TMR2 數到 CCPR1L：CCP1CON<5:4>，再接著數到 PR2, loop
  ↳ PWM Period = $(PR2+1) \times \underset{inst.cycle}{(4 \times TOSL)} \times prescaler$

  ↳ duty cycle = $(\underset{整數}{CCPR1L} : \underset{小數}{CCP1CON<5:4>}) \times TOSL \times prescaler$ ⇒ 不用 ×4