EXPERIMENT 4: Branch Operations

Conditional Jumps

JC <address>

If the carry is equal to 1, branch to the indicated address.

Example The accumulator contains F1H, the B register contains 42H. Write a program code that sum this two numbers. And if carry is equal to 1, move the A1H in R1 register. If not, move the B5H in R7 register.

Solution

```
        MOV A, #0F1H
        MOV B, #42H
        ADD A, B
        JC here              ;If the carry is equal to 1, branch to the 'here'.
        MOV R7, #0B5H
here: MOV R1, #0A1H
        END
```

Exercise The R0 register contains AEH, the R7 register contains 85H. Write a program code that sum this two numbers. And if carry is equal to 1, move the 0FH in P0 port. If not, move the F0H in P2 port.

```
JB jump          ; jump if bit = 1
JNB jump         ; jump if bit = 0
```

Consider a practical example of testing switched logic levels. Refer to Figure 3.2. If the switch is not pressed the voltage on the port pin is 0 V. When the switch is pressed and held, then the port pin is connected directly to 5 V. To test for switch being pressed, the following program could be used:

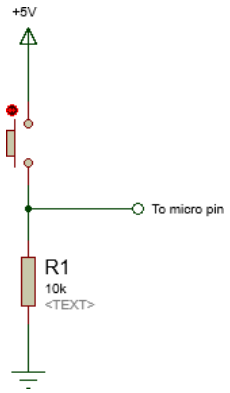
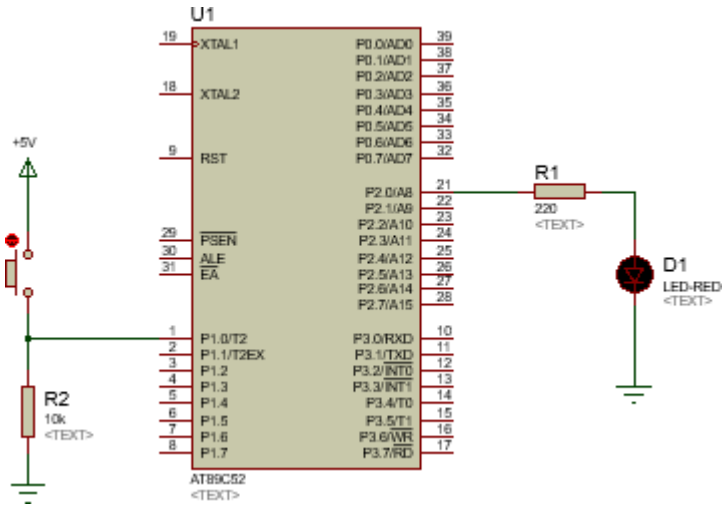


Figure 3.2 Circuit to produce logic levels 0 or 1 at a port pin. Circuit normally producing logic 0

```
        ORG 0                   ; sets start address to 0
STAR    JB P1^0, DoSomething    ; jump to DoSomething if pin 0 port 1 is logic 1
        SJMP START              ; go to START check switch
DoSomething: ...
```

Example 3.4 A button connected to the pin 0 of port 1 and a LED connected to the pin 0 of port 2. Write a program code that if the switch is pressed, then turn on the LED.

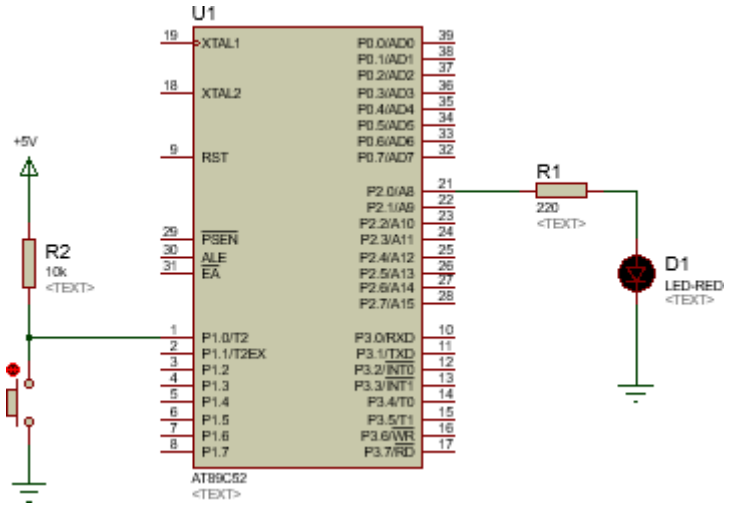
Solution




```
                ORG 0                   ; sets start address to 0
                MOV P1, #00H            ; reset port 1
                MOV P2, #00H            ; reset port 2
START:          JB P1^0, DoSomething    ; jump to DoSomething if pin 0 port 1 is logic 1
                SJMP START              ; go to START check switch
DoSomething:    SETB P2^0               ; set pin 0 of port 2

                END
```

Exercise A button connected to the pin 0 of port 1 and a LED connected to the pin 0 of port 2 (following figure). Write a program code that if the switch is pressed, then turn on the LED.



JNC <address>

If the carry is equal to 0, branch to the indicated address.

Example The R4 register contains 28H, the B register contains 17H. Write a program code that multiply this two numbers. And if carry is equal to 0, move the 04H in P1 port. If not, move the 47H in P2 port.

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Solution

```
        MOV R4, #28H
        MOV B, #17H
        MOV A, R4
        MUL AB
        JNC jump     ; If the carry is equal to 0, branch to the ‘here’.
        MOV P2, #47H
jump:   MOV P1, #04H
        END
```

JZ <address> ; Jump if the accumulator is equal to 0

This instruction tests the contents of the accumulator. If the contents are equal to 0 it causes a jump to the indicated address, otherwise execution continues with the next instruction.

JNZ <address> ; Jump if the accumulator is not equal to 0

This instruction also tests the contents of the accumulator. However, if the contents are NOT equal to 0 it causes a jump to the indicated address, otherwise execution continues with the next instruction.

Example The accumulator contains 08H. Decrease the accumulator until it become zero.

Solution

```
        MOV A, #08H
jump: SUBB A, #01H
        JNZ jump
        END
```

Exercise The accumulator contains 10H. Decrease the accumulator until it become zero. Use DEC command.

DJNZ <address> ; Decrement and jump if not zero

Example The R1 register contains 0FH. Decrease the R1 register until it become zero.

Solution

```
            MOV R1, #0FH
    jump:   DJNZ R1, jump
        END
```

The $ Operator

Most assemblers use the $ character as a pointer to the current program location. Therefore, the instruction DJNZ R0, $ means - decrement the contents of R0 and if the result is non-zero jump back to this line. In this way, the contents of R0 are continuously decremented until they reach zero

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Example The R7 register contains 04H. Decrease the R7 register until it become zero.

Solution

```
        MOV R7, #04H
        DJNZ R7, $
         END
```

Unconditional branch operations

are ACALL absolute call

LCALL long call

ACALL calls up a subroutine, the subroutine must always have RET as its last operation. ACALL range is limited to +127 places forward or -128 places backward. If

your program jumps further than ACALL the compiler will report that the program is jumping out of bounds and replacement by LCALL will solve the problem.

ACALL is two bytes long, LCALL is three bytes long.

Consider an example (a subroutine called by ACALL):

```
DELAY:  MOV R0,#34      ; move decimal 34 into register R0
TAKE:   DJNZ R0,TAKE    ; keep subtracting 1 from R0 until zero
        RET             ; return from subroutine
```