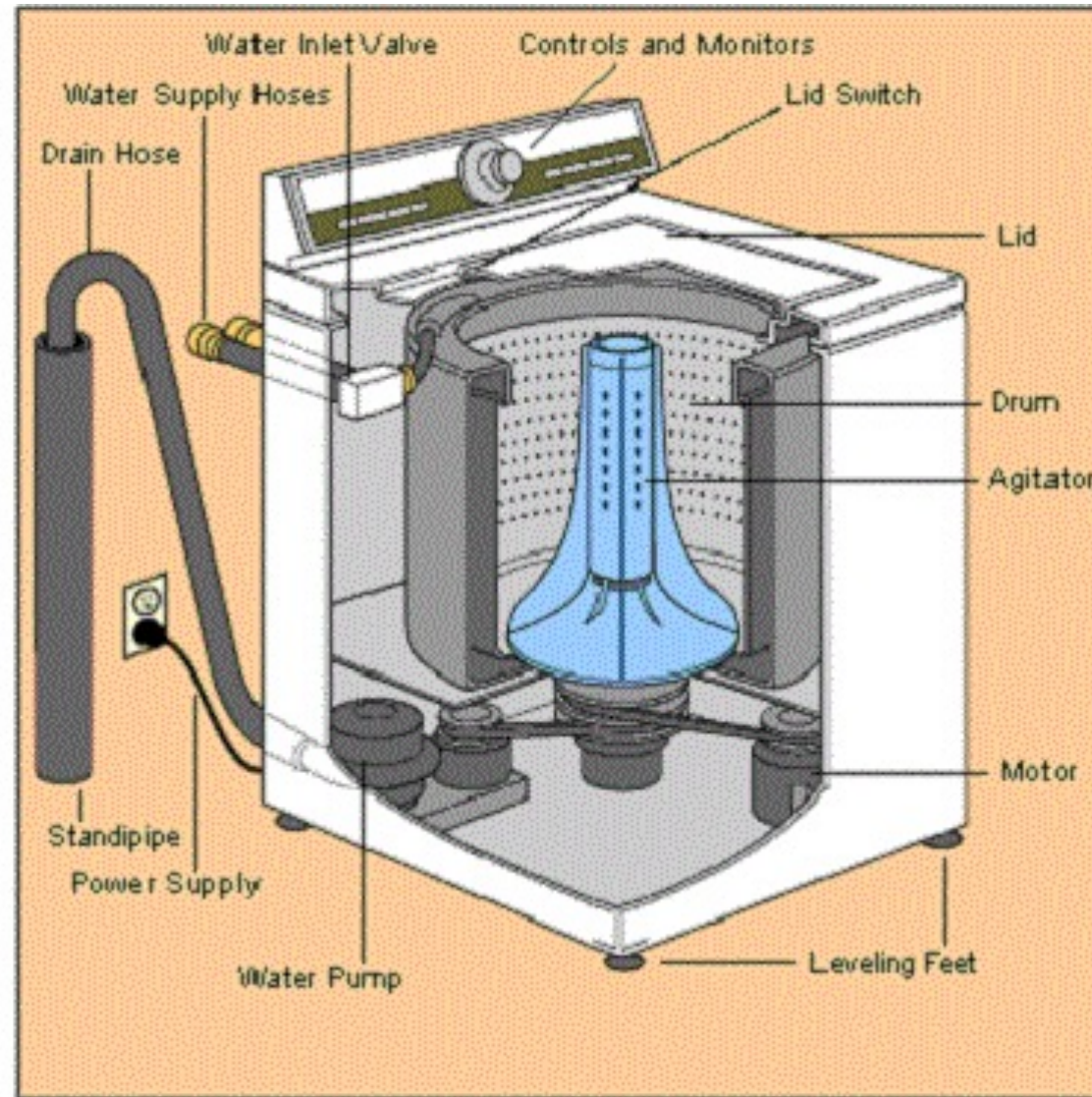


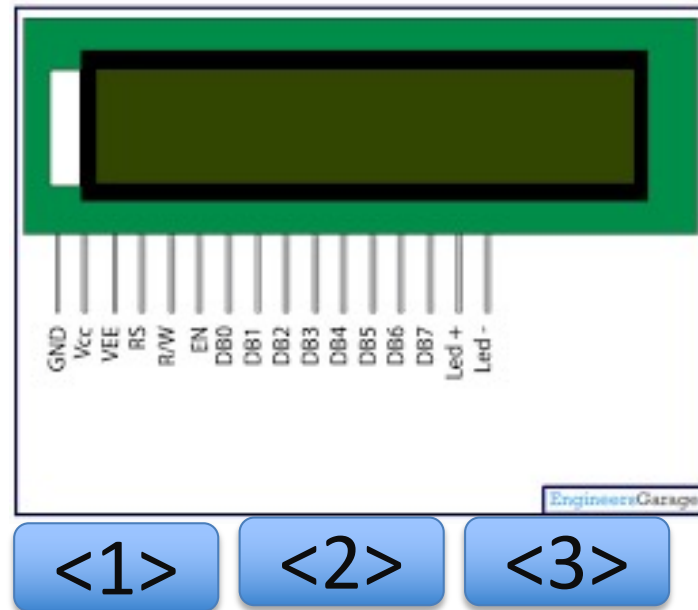
# Máquina de Lavar em Assembly AVR

Prof. Marcos Chaves

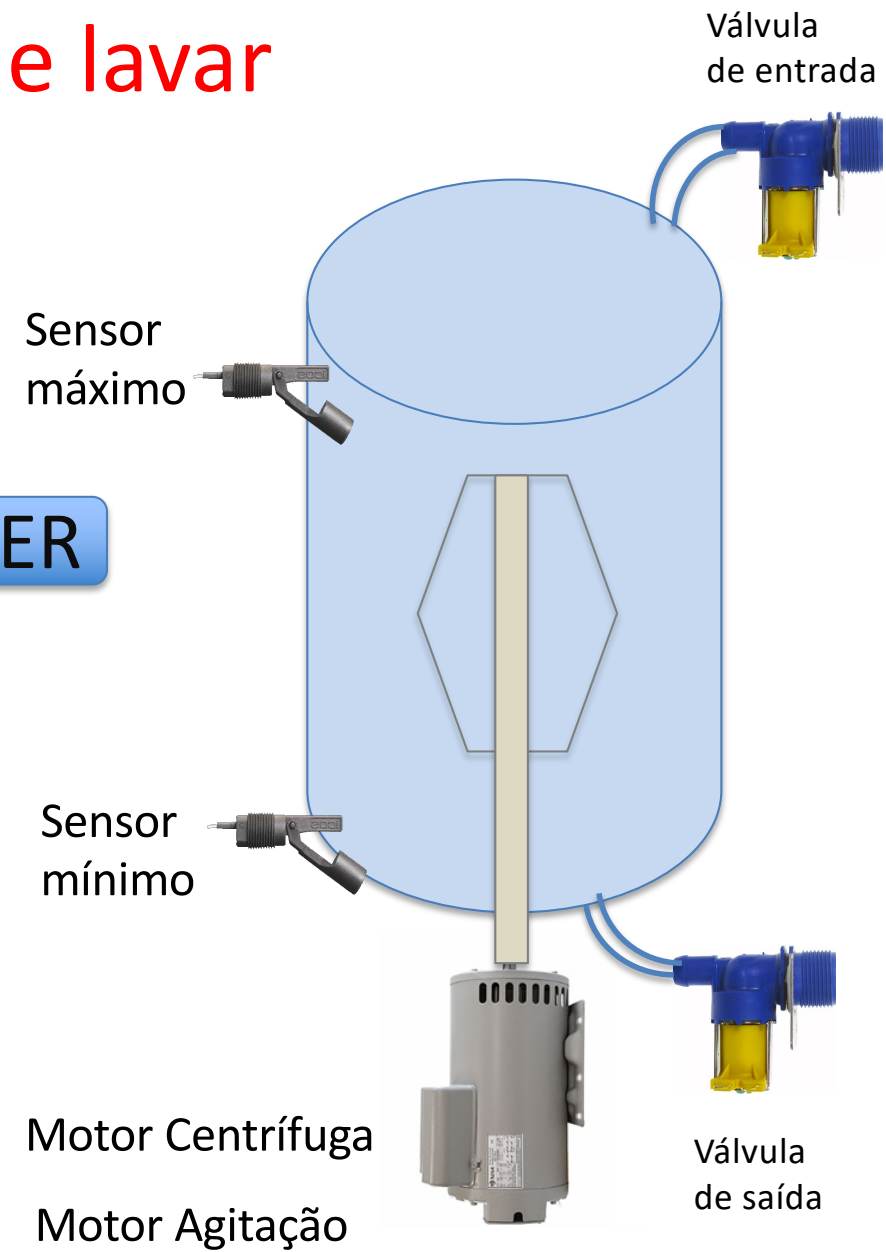
# Modelo máquina de lavar

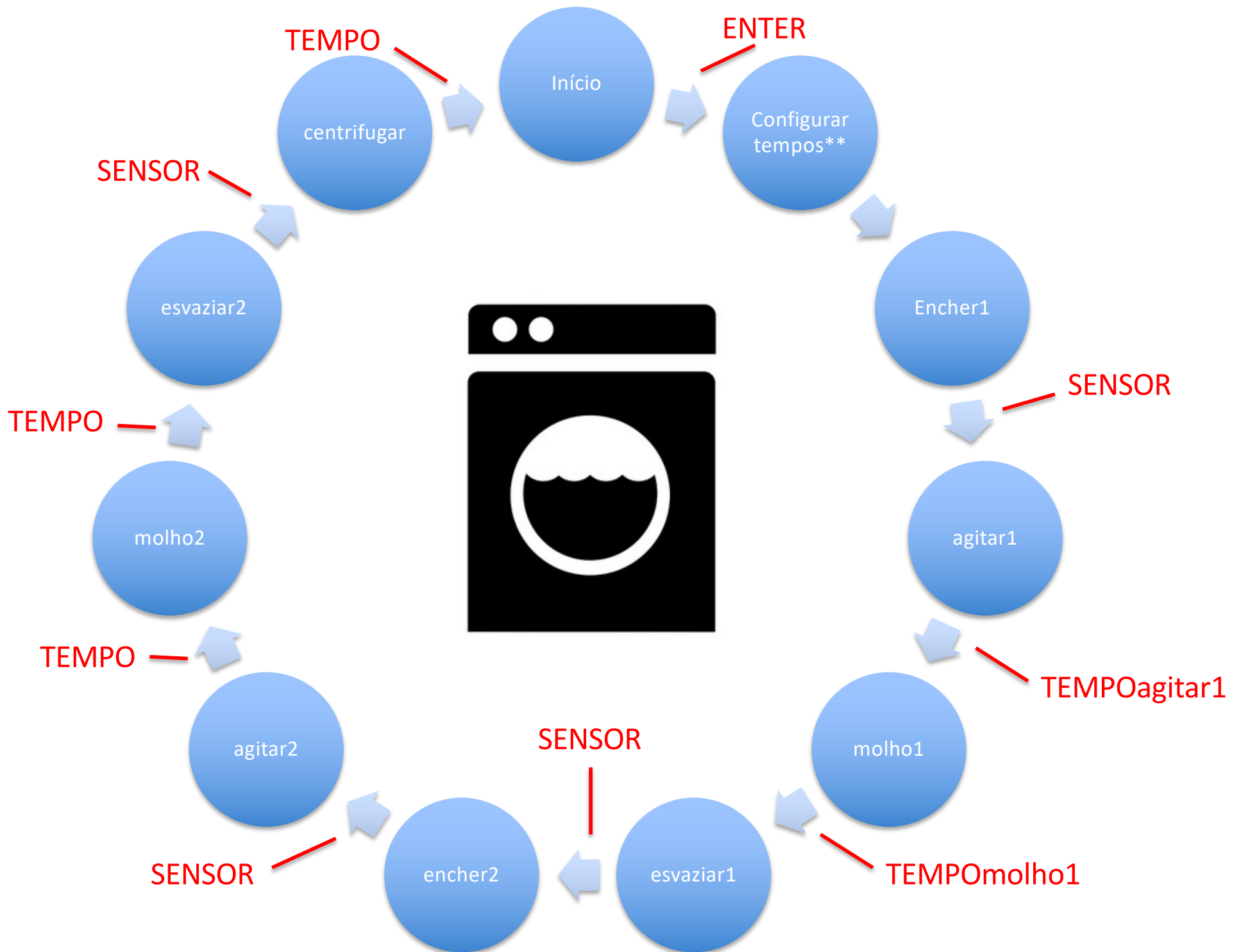


# Modelo máquina de lavar



ENTER

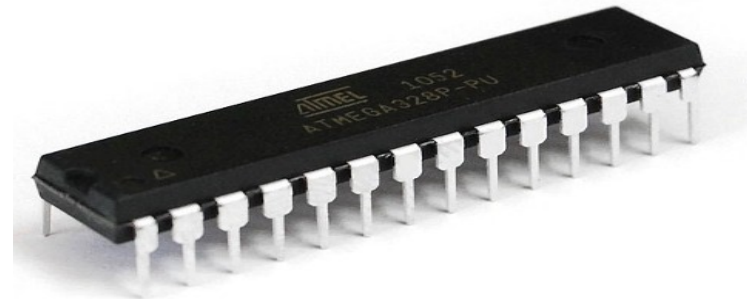




## 28 PDIP

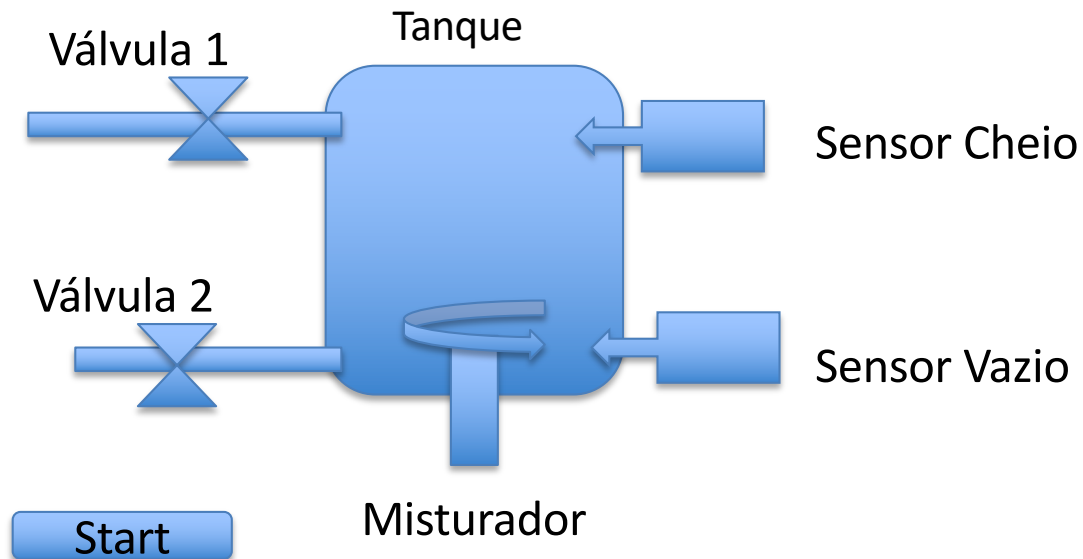
(PCINT14/RESET) PC6	1	28	PC5 (ADC5/SCL/PCINT13)
(PCINT16/RXD) PD0	2	27	PC4 (ADC4/SDA/PCINT12)
(PCINT17/TXD) PD1	3	26	PC3 (ADC3/PCINT11)
(PCINT18/INT0) PD2	4	25	PC2 (ADC2/PCINT10)
(PCINT19/OC2B/INT1) PD3	5	24	PC1 (ADC1/PCINT9)
(PCINT20/XCK/T0) PD4	6	23	PC0 (ADC0/PCINT8)
VCC	7	22	GND
GND	8	21	AREF
(PCINT6/XTAL1/TOSC1) PB6	9	20	AVCC
(PCINT7/XTAL2/TOSC2) PB7	10	19	PB5 (SCK/PCINT5)
(PCINT21/OC0B/T1) PD5	11	18	PB4 (MISO/PCINT4)
(PCINT22/OC0A/AIN0) PD6	12	17	PB3 (MOSI/OC2A/PCINT3)
(PCINT23/AIN1) PD7	13	16	PB2 ( $\overline{SS}$ /OC1B/PCINT2)
(PCINT0/CLKO/ICP1) PB0	14	15	PB1 (OC1A/PCINT1)

**Porta D**



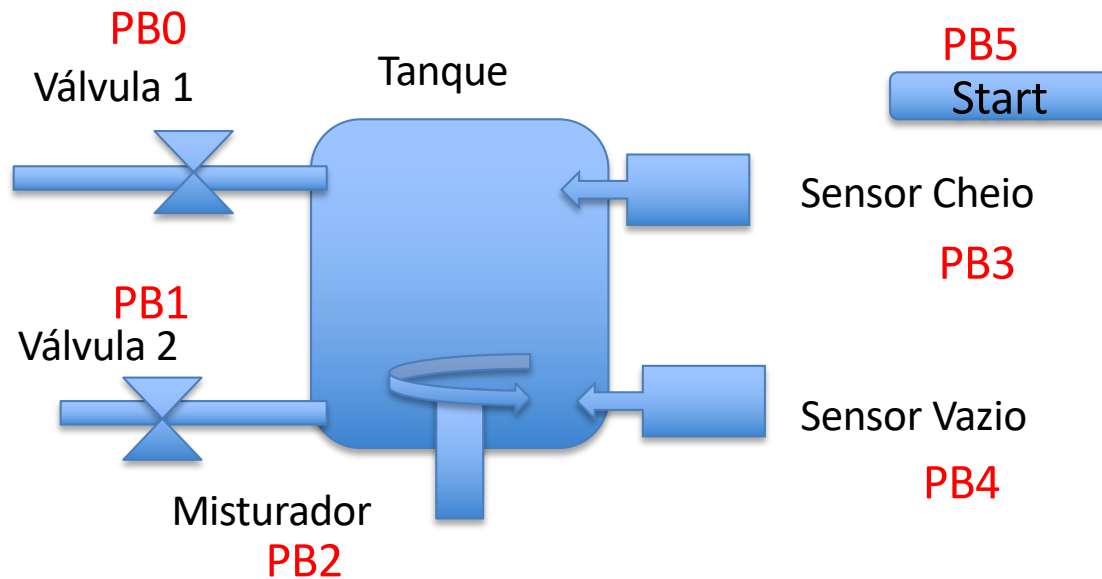
AVR Atmega 328P

## Exemplo de programa



Defina pinos de entrada e saída. As entradas com push button em terra e pull up ativos. O Programa aguarda "Start" ser pressionado, que liga a Válvula 1 até que sensor cheio seja acionado.

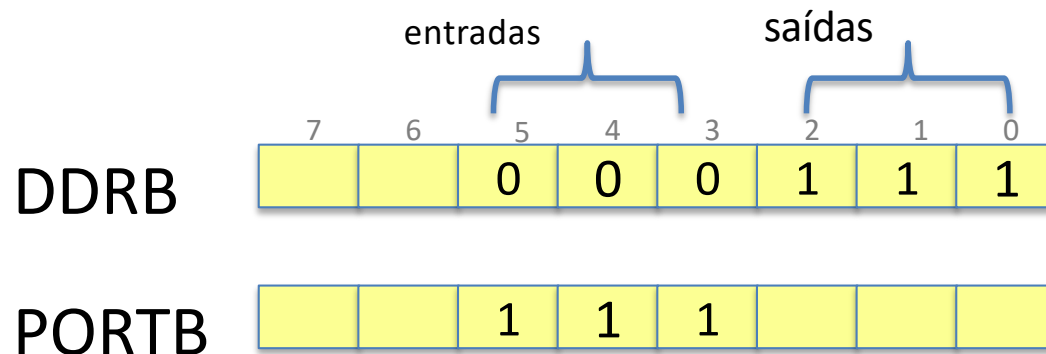
O misturador é acionado por 2 segundos. Esvazia-se o tanque até o sensor vazio ser acionado. Voltando ao estado inicial. Considere clock 16Mhz.



### Resolução:

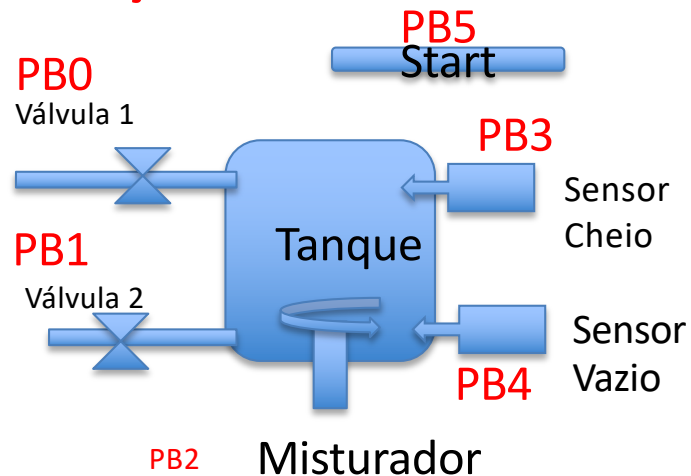
; define entradas e saídas  
Início:

```
ORG 0x00
LDI R16, 0b00000111
OUT DDRB, R16
LDI R16, 0b00111000
OUT PORTB, R16
```



Ligando pull-up nas entradas

## Resolução:



; define entradas e saídas  
Início:

```
ORG 0x00  
LDI R16, 0b00000111  
OUT DDRB, R16  
LDI R19, 0b00111000  
OUT PORTB, R16
```

; testa sensor ou botão

PRINCIPAL:

```
SBIC PINB,5  
RJMP PRINCIPAL  
RJMP ENCHER
```

; testa sensor cheio  
ENCHER:

```
SBI PORTB,0  
SBIC PINB,3  
RJMP ENCHER  
CBI PORTB,0  
RJMP MISTURAR
```

; liga valvula por tempo  
MISTURAR:

```
SBI PORTB,2  
RCALL ATRASO  
RCALL ATRASO  
CBI PORTB, 2  
RJMP ESVAZIAR
```

; aguarda sensor vazio

ESVAZIAR:

```
SBI PORTB,1  
SBIC PINB,4  
RJMP ESVAZIAR  
CBI PORTB,1  
RJMP PRINCIPAL
```

; rotina de atraso  
ATRASO:

```
LDI R19,80  
volta:  
DEC R17  
BRNE volta  
DEC R18  
BRNE volta  
DEC R19  
BRNE volta  
RET
```



# MOVIMENTAÇÃO DE REGISTROS(BYTES)

