

# Esercizi di apprendimento

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1:
2: ;macchina di confezionamento
3:
4: ;due rielé "M" (M0) e "N" (N1), comandano due motori che fanno muovere due nastri
5: ;trasportatori. "M1" (M2) trasporta pezzi e "M2" (M1) imballaggi. Un sensore "DP" (M3)
6: ;rilascia il passaggio dei pezzi e l'altra, "DC" (M2), rilassa il corretto posizionamento di
7: ;un contenitore. Dopo che sono passati 10 pezzi, la confezione si considera piena, si
8: ;attiva un segnale acustico. "R" (R2), e il nastro che trasporta gli imballaggi parte,
9: ;sino a posizionare un nuovo imballo vuoto. In questo momento si disattiva il segnale
10: ;acustico "R" (R2), e avanza nuovamente il nastro dei pezzi ripetendo così il ciclo.
11: ;un interruttore "I" (R3) attiva o disattiva l'intero sistema.
12:
13: list p=68020 ;tipo di processore
14: include "P68020.INC" ;definizione dei registri interni
15:
16: conta_pezzi equ 0x20 ;variabile M di pezzi
17:
18: org 0x00
19:
20: inizio cldw PORTB ;cancella i latch di uscita
21: bcf STATUS,MPH ;seleziona banco 1
22: cldw TRISB ;configura la Porta B come uscita
23: movlw 0x0F ;
24: movwf TRISC ;configura la Porta B come ingresso
25: bcf STATUS,MPH ;seleziona banco 0
26:

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Gli esercizi che abbiamo realizzato sinora erano esempi combinatori. In questo tipo di esercizi si disponeva di un insieme di segnali di ingresso che venivano letti una volta, si operava su di essi e si ottenevano dei risultati che erano visualizzati tramite i diodi led. Questo tipo di funzionamento è comune in molti algoritmi per i robot. Si legge lo stato dei sensori e in funzione della combinazione letta si eseguono diversi ordini sui motori. Ora realizzeremo un tipo diverso di esercizi, quelli chiamati sequenziali. Le azioni sono determinate dal modo in cui si attivano i sensori.

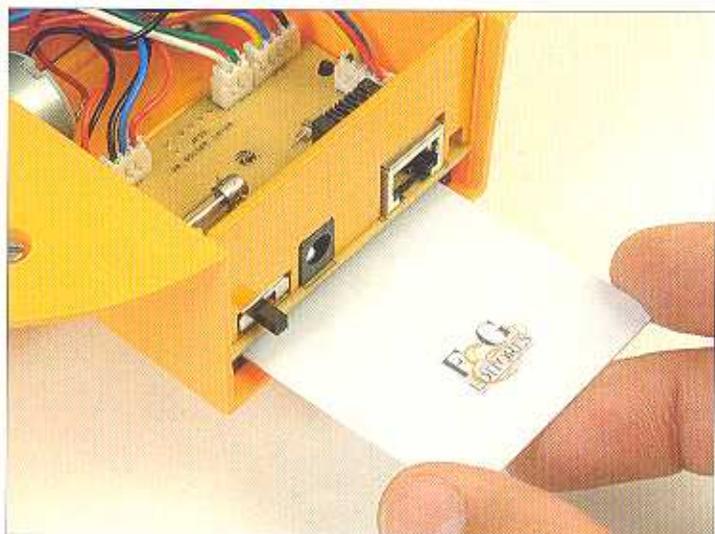
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26: loop_0 cldw PORTB ;cancella le uscite
27: loop_1 cldw PORTB ;aggiorna il VOI
28: loop_2 movlw 0 ;
29: loop_3 movlw conta_pezzi ;inizializza la variabile M di pezzi
30: loop_4 btss PORTC,0 ;testa lo stato dell'interruttore 1
31: loop_5 goto loop_0 ;if su OFF, sistema fermo
32: loop_6
33: loop_7 bcf PORTB,0 ;svuotamento dei pezzi a OFF
34: loop_8 bsf PORTB,1 ;avanzamento del contenitori a ON
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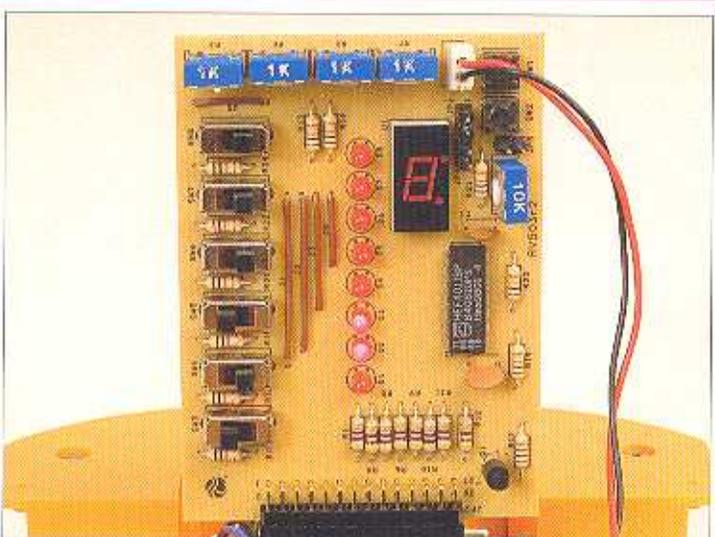
```



Per compilare il programma copieremo il file es15.asm sull'hard disk. Nella cartella in cui si copia dovrà essere inserito anche il file P16F870.INC, che contiene tutte le definizioni dei registri del microcontroller. Potremo generare un progetto e inserire in esso il file o semplicemente aprirlo e selezionare l'opzione Build Node del menù Project per compilare l'esercizio. Dopo aver ottenuto il file es15.hex, daremo seguito alla programmazione della Smartcard utilizzando il programma ICPROG e la scheda di scrittura con lo stesso procedimento che conosciamo già.



Per verificare questo esercizio, la scheda di ingresso e uscita dovrà essere collegata alla scheda di interfaccia tramite il connettore JP13. Il microcontroller dovrà essere inserito sulla scheda di controllo con il programma uploader.hex caricato. La Smartcard verrà inserita nella scheda di alimentazione con il programma es15.hex scritto. Dopo aver alimentato il robot, il microcontroller impiegherà alcuni secondi a leggere il contenuto della scheda Smartcard e a iniziare l'esecuzione del programma. Sulla scheda di ingresso e uscita dovrà essere chiuso il jumper JP1 e aperti i jumper JP4 e JP5.



Quando si inizia a provare l'esercizio, tutti gli interruttori dovranno essere posizionati in modo da inviare uno zero logico (la levetta dell'interruttore verso l'interno della scheda). Ora procederemo ad attivare gli interruttori nell'ordine adeguato, simulando l'attivazione dei sensori del nastro trasportatore. I diodi LED si attiveranno in modo sequenziale, simulando le diverse operazioni che realizzano gli attuatori sui pezzi presenti sul nastro trasportatore. A causa dell'effetto rimbalzo dei sensori meccanici, che vi abbiamo spiegato in passato, in alcuni casi anche con meno di dieci attivazioni dell'interruttore, il sistema conterà ugualmente dieci pezzi. In altri esercizi sarà applicata la soluzione software per correggere l'effetto rimbalzo.