

Control of industrial process using PROSIM –process simulator

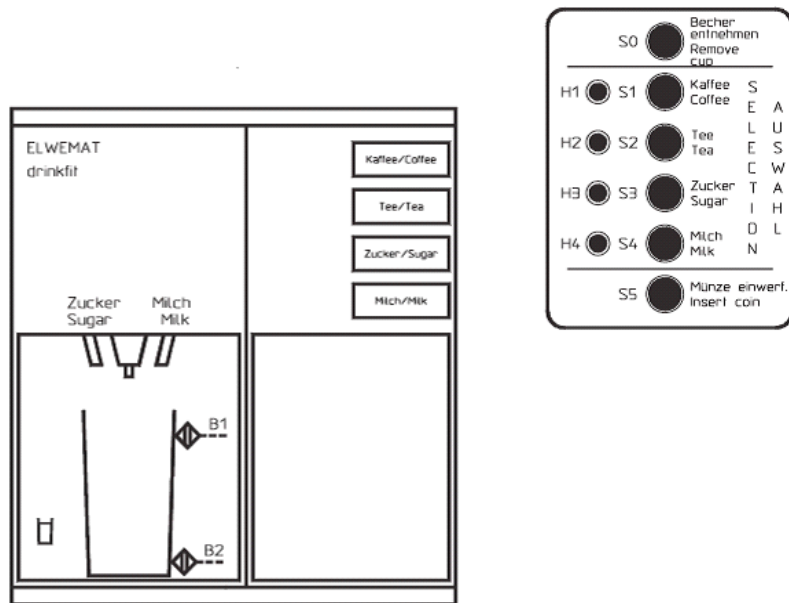
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Grupa: 30134

Automatica si Informatica Aplicata

M47 - Automat bauturi calde

- Masca Procesului:



- Descriere Functionala:

Dupa introducerea unei monede (activarea butonului S5), mai intai o bautura, si mai apoi ingredientele sunt selectate cu ajutorul butoanelor S1, S2, S3 si S4. Selectiile sunt semnalizate cu ajutorul lampilor P1, P2, P3 si P4. Procesul de umplere este complet atunci cand senzorul B1 este activat. In acest moment selectia dispare de pe panoul automatului. Paharul este inlaturat simbolic prin activarea butonului S0 si o noua comanda poate fi preluata.

- Mod de lucru:

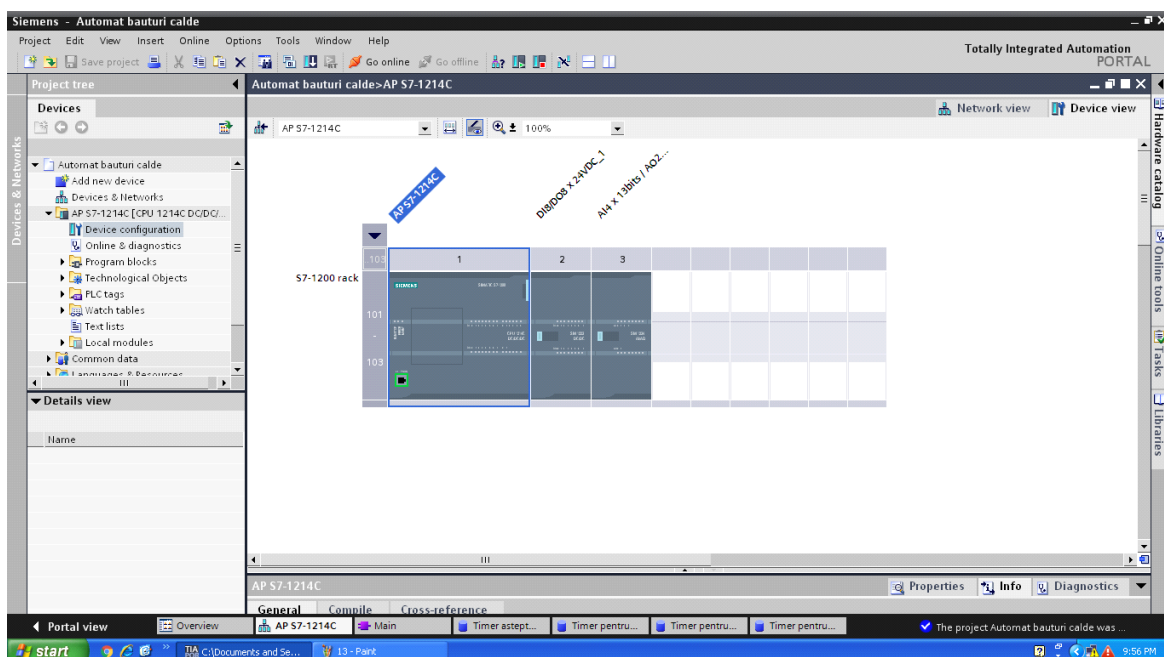
- Se deschide programul Totally Integrated Automation si selectez optiunea Create New Project. In campurile noi se trece numele proiectului si autorul, si o scurta descriere a proiectului. La sectiunea Path se selecteaza fisierul unde este salvat proiectul. Mai apoi selectam Create.
- Se configureaza componentele proiectului, PLC-ul si blocurile de intrari/iesiri analogice si digitale: Din fereastra noua selectez optiunea Configure a device -> Add new device. Selectez unitatea CPU 1214C, 6ES7 214-1AE30-0XB0 -> Add.
Din fereastra situata in partea dreapta selectez Hardware catalog si adaug modulele pentru intrari/iesiri digitale si analogice: intai selectez DI/DO -> DI8/DO8 x 24VDC -. 6ES7 223-1BH30-0XB0 si se adauga la proiect; pentru

exemplificare selectez un modul de intrari/iesiri analogice, AI/AO -> AI4 x 14 bits -> 6ES7 234-4HE30-0XB0.

Selectez PLC-ul si din fereastra de configurare selectez Properties -> General -> Project Information -> Name si introduc: AP S7-1214C.

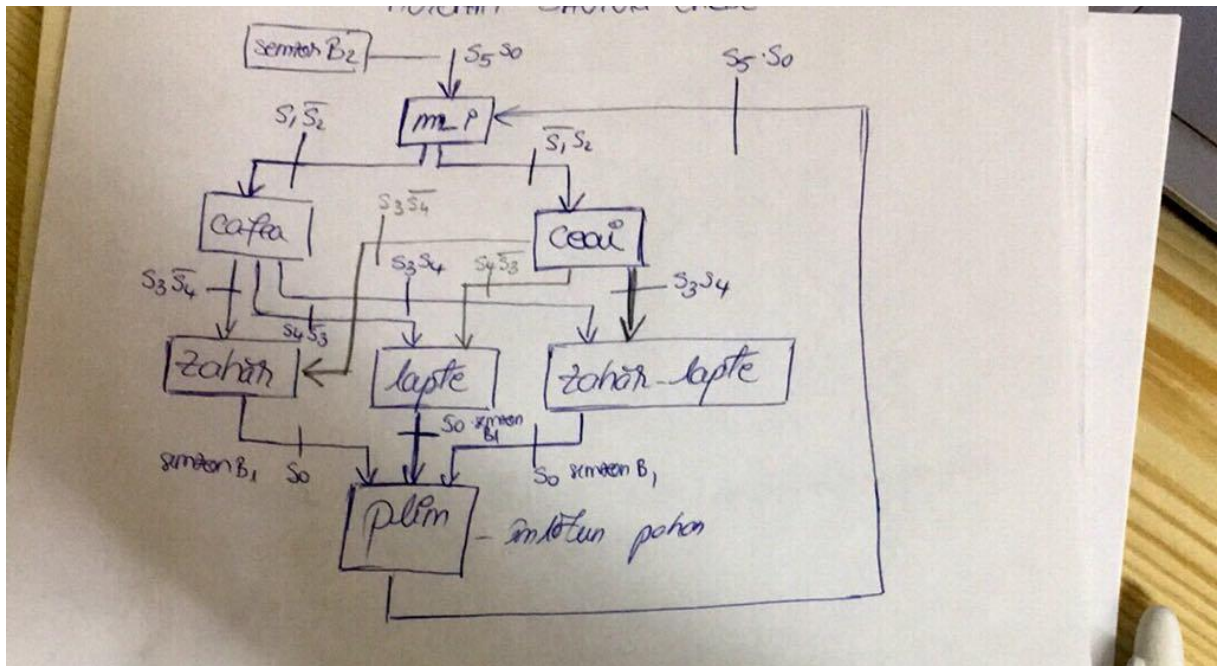
Selectez PROFINET Interface -> Ethernet address -> Add new subnet. La IP addresses introduc 192.168.0.10, iar la Subnet mask 255.255.255.0. Din General -> System and clock memory bifez pe rand Enable the use of system memory byte si Enable the use of clock memory byte.

Pentru configurarea modului DI/DO, se selecteaza modulul, se specifica autorul, iar apoi, din General -> DI8/DO8 -> IO addresses/ HW identifier se specifica adresa de start pentru semnalele de intrare si iesire: Input addresses -> Start address -> 2, Output addresses -> Start addresses -> 2. Analog se procedeaza pentru modulul AI/AO, cu diferenta ca adresa de start e 3. Project->Save.



- Mai departe scriem programul utilizand diagramele ladder(liniile verticale reprezinta sursa de putere si liniile orizontale circuitele de control). Intram in Project tree si selectam numele PLC-ului configurat. Din sectiunea Bit logic ne folosim de instructiunile necesare pentru a realiza descrierea functionala a procesului. Redactarea proiectului se realizeaza cu ajutorul Network-urilor.

- Am realizat urmatorul GRAFCET pentru descrierea functionala:



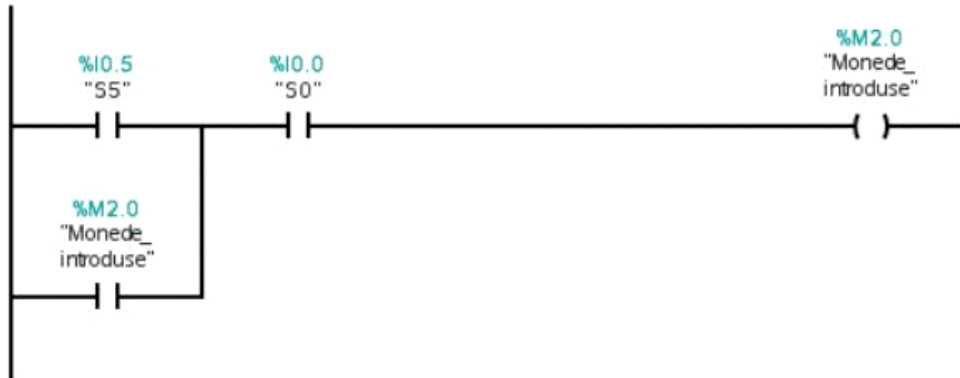
- Si avem ecuatiile:

$$\begin{aligned}
 m_i &= \text{Memorie-introducere} \\
 m_i &= S_5 S_0 + m_i \cdot \text{cafea} + m_i \cdot \text{ceai} + S_5 S_0 \text{plim} \\
 \text{cafea} &= m_i \cdot S_1 \bar{S}_2 + \text{cafea} \cdot \text{zahar} + \text{cafea} \cdot \text{lapte} + \text{cafea} \cdot \text{zahar-lapte} \\
 \text{ceai} &= m_i \cdot \bar{S}_1 S_2 + \text{ceai} \cdot \text{zahar} + \text{ceai} \cdot \text{lapte} + \text{ceai} \cdot \text{zahar-lapte} \\
 \text{zahar} &= \text{cafea} \bar{S}_2 \bar{S}_3 S_4 + \text{ceai} \bar{S}_1 S_3 \bar{S}_4 + \text{zahar} \cdot \text{plim} \\
 \text{lapte} &= \text{cafea} \bar{S}_2 \bar{S}_3 S_4 + \text{ceai} \bar{S}_1 \bar{S}_3 S_4 + \text{lapte} \cdot \text{plim} \\
 \text{zahar-lapte} &= \text{cafea} \bar{S}_2 S_3 \bar{S}_4 + \text{ceai} \bar{S}_1 S_4 S_3 + \text{zahar-lapte} \cdot \text{plim} \\
 \text{plim} &= B_1 S_0 \text{zahar} + B_1 S_0 \text{lapte} + B_1 S_0 \text{zahar-lapte} + \text{plim} \cdot m_i
 \end{aligned}$$

- Din cele de mai sus am obtinut urmatoarea configuratie ladder:

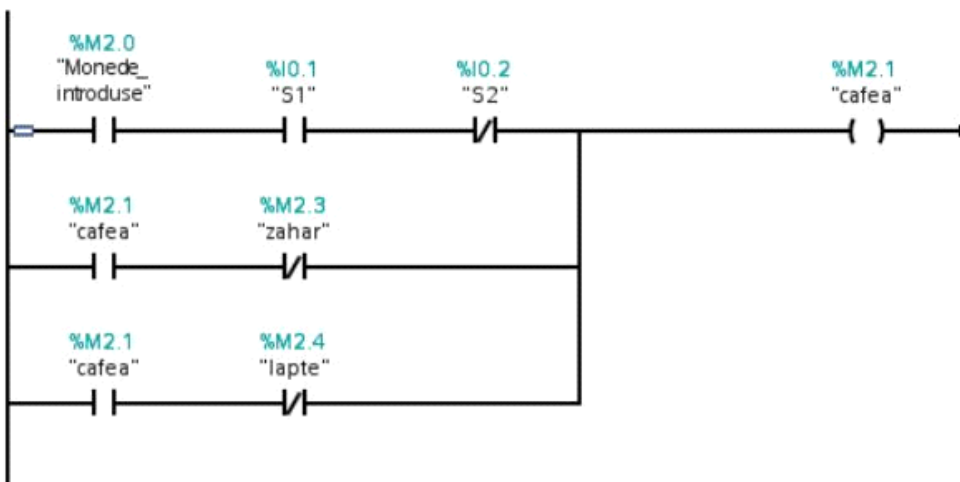
Network 1: Pornire:

Introducerea monedelor determina plata:



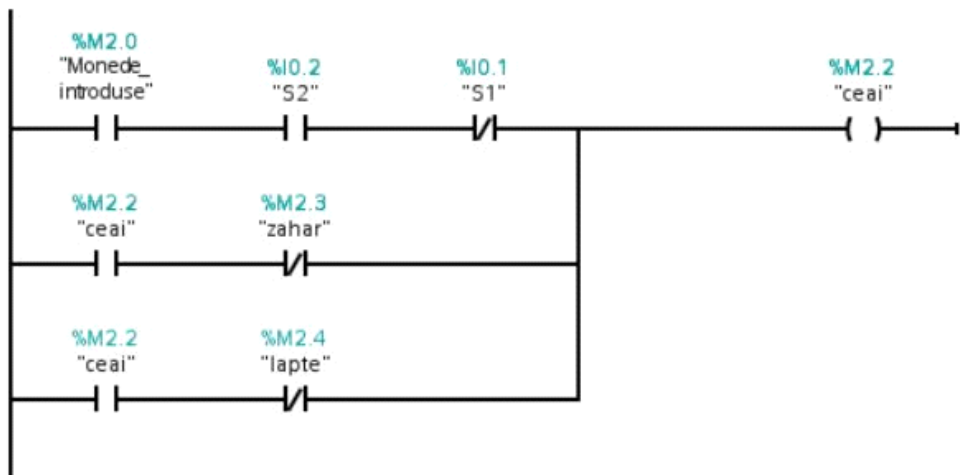
Network 2: Selectare cafea:

Comment



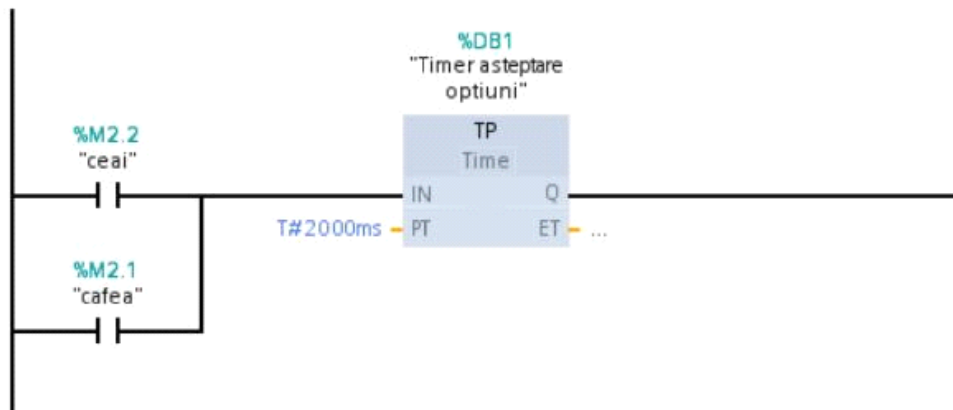
Network 3: Slectie ceai:

Comment



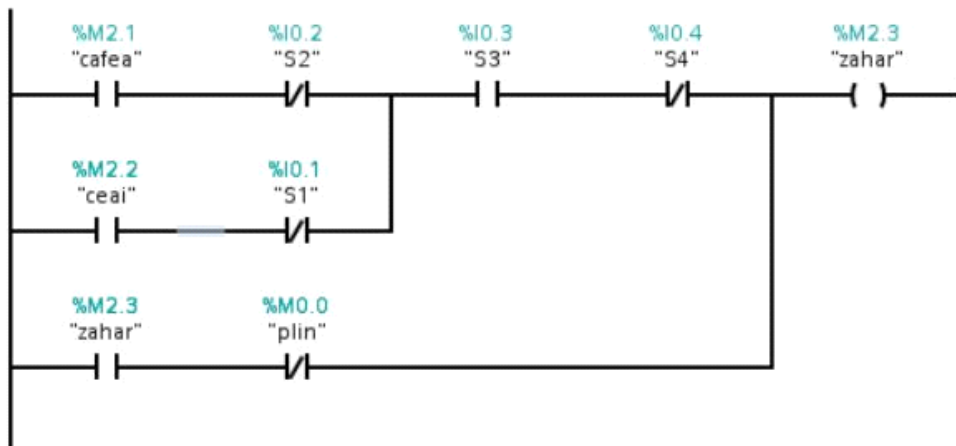
▼ **Network 4:** Temporizare pentru asteptarea optiunilor: zahar, lapte, zahar si lapte

Comment



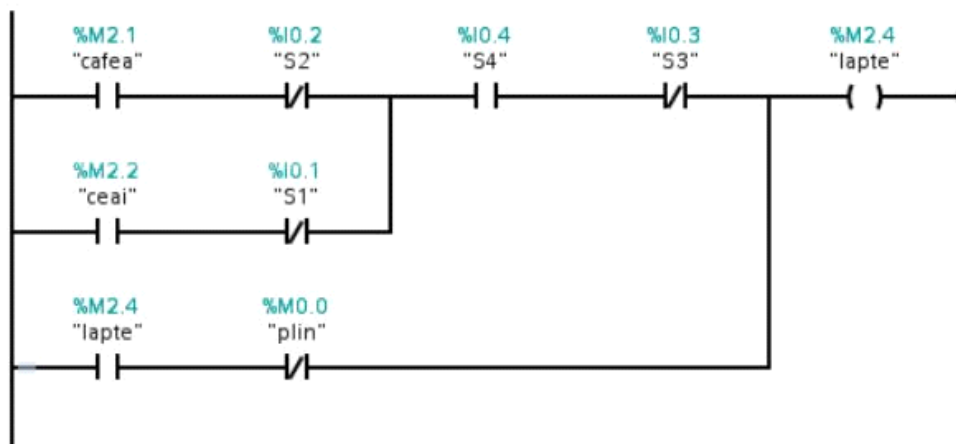
▼ **Network 5:** Selectie zahar:

Comment



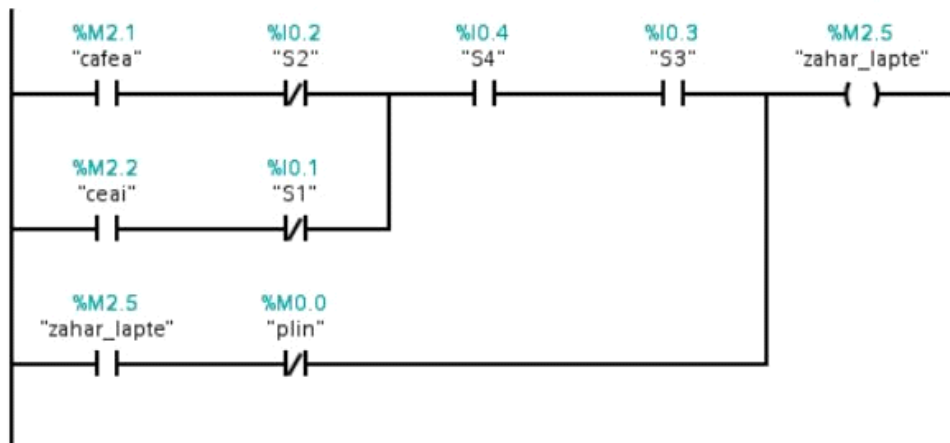
▼ **Network 6:** Selectie lapte:

Comment



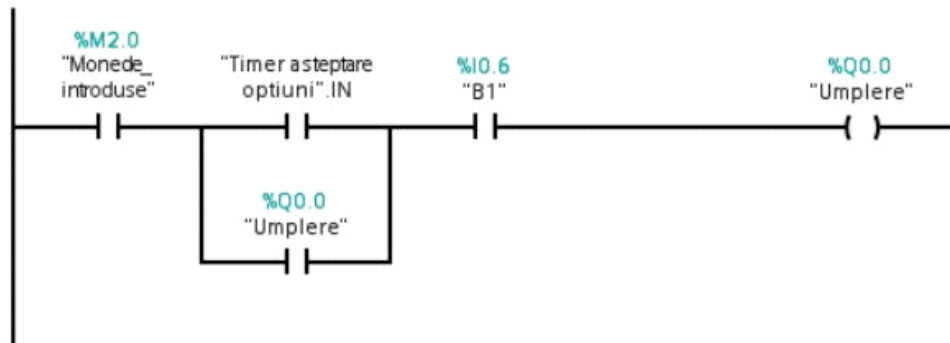
▼ **Network 7:** Selectie lapte si zahar:

Comment



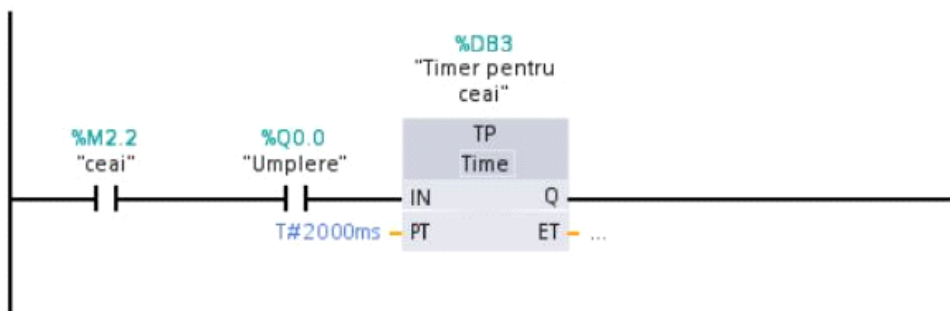
▼ **Network 8:** Torn:

Comment

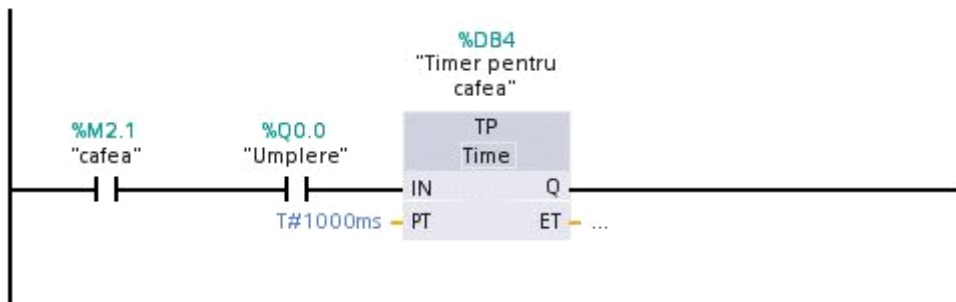


▼ **Network 9:** Temporizare la turnarea ceaiului:

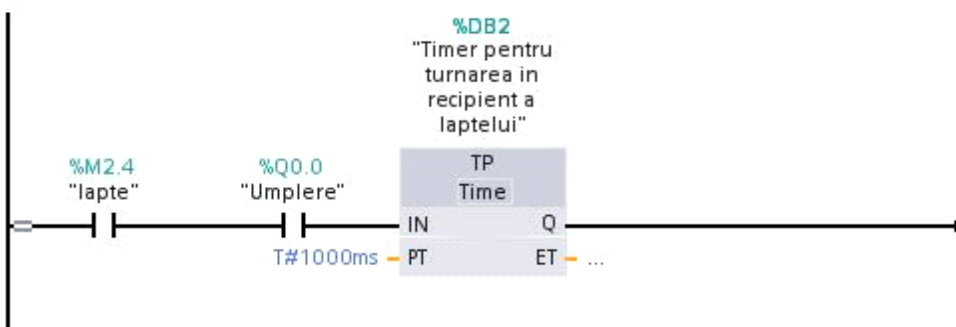
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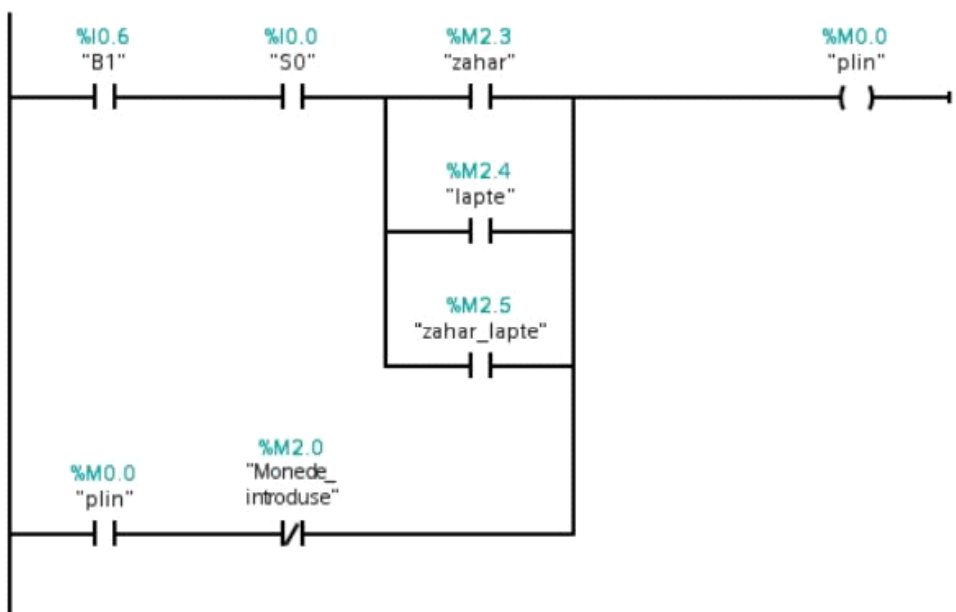
▼ **Network 10:** Timer pentru turnare cafea:
 Comment



▼ **Network 11:** Turnare lapte in pahar:
 Comment

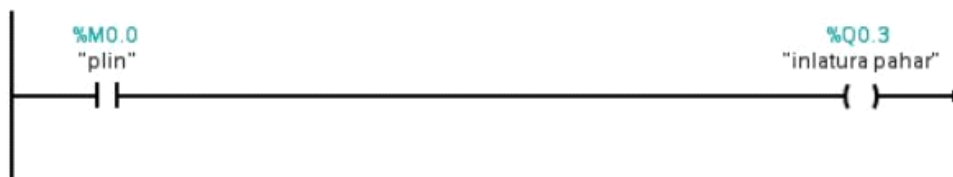


▼ **Network 12:** Starea in care paharul este plin si urmeaza a fi inlaturat:
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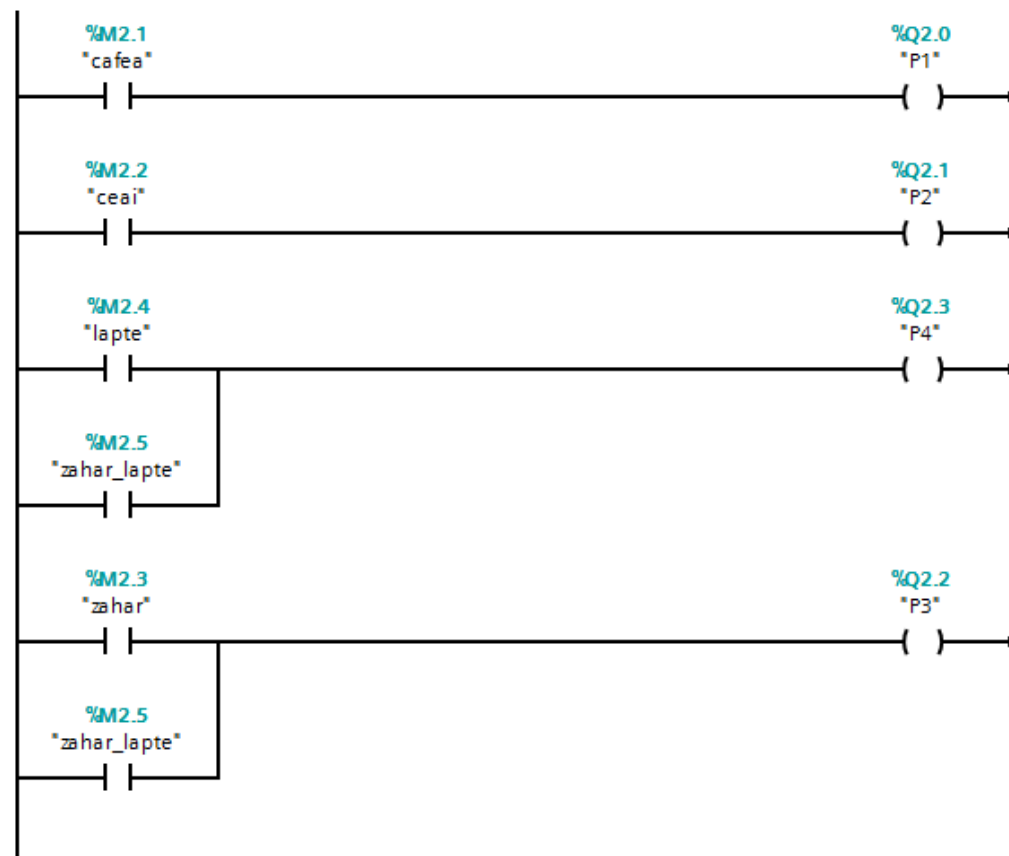
▼ **Network 13:** Inlaturare simbolica pahar

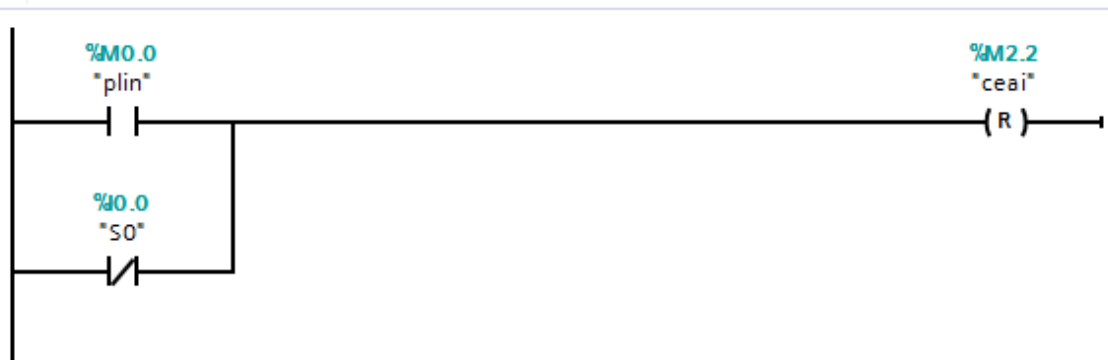
Comment



▼ **Network 14:** Semnalizarea selectiilor cu lampi:

Comment





▼ **Network 16:**

Comment



▼ **Network 17:**

Comment

