



Automation Lab. 2

Lab. Exercise No.2 Task

The task is to...

- **2.a**
 - *transport several jobs* in the conveyor (clockwise).
 - increase the efficiency of the process by utilising **both lifts simultaneously**.
- **2.b**
 - *Implement Lab 1a in Functional Block Diagram (FBD).*

Initial state:

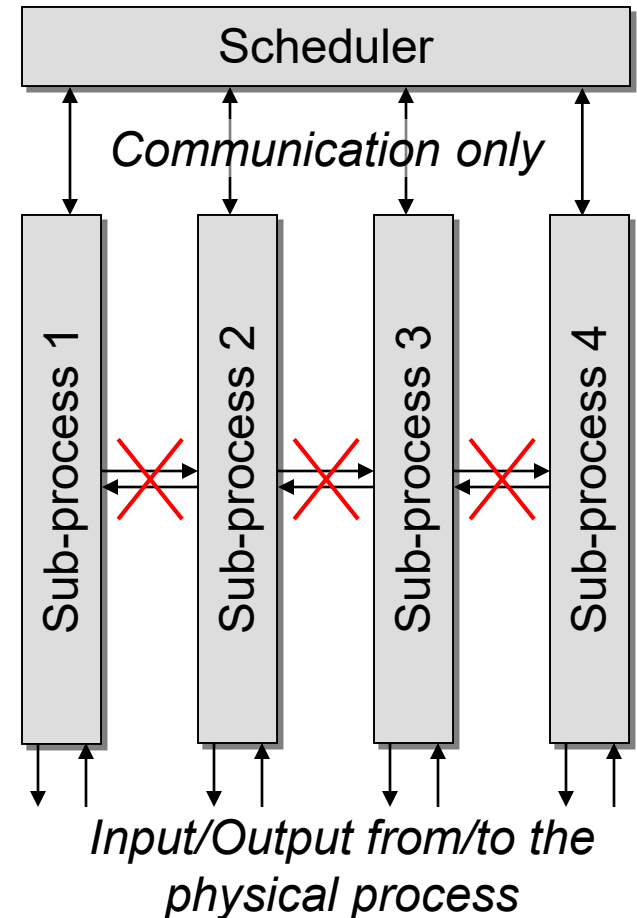
- Jobs placed on the upper conveyor, to the left of block B2.
- Run upper (M1) and lower (M3) conveyors continuously.

Condition:

- Only one job in the lift at a time.

Task 2.a: CoDeSys Project

- The project setup from Lab 1. (not the LD-program)
- The conveyor process can be divided into four sub-processes.
- A separate program for each sub-process written in SFC.
- A synchronisation program, *Scheduler*, written in SFC.
- Only synchronisation signals may be used in the Scheduler - no physical input/output.
- No access of physical input/output or communication between sub-processes.



Task 2.a: Synchronisation Signals

- Used for communication between the scheduler and the programs of sub-processes, examples:

```
Job_to_load_2      Lift_2_Ready  
Job_loaded_2      ...
```

- They have to be declared as global variables.

Task 2.a: Synchronisation Signals

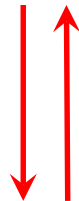
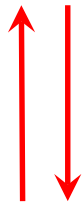
SCHEDULER

RECEIVE SIGNAL:

upperconv_ready
lift2_ready

SEND SIGNAL:

load_job



SUBPROGRAM_1

SEND SIGNAL:

upperconv_ready

RECEIVE SIGNAL:

load_job

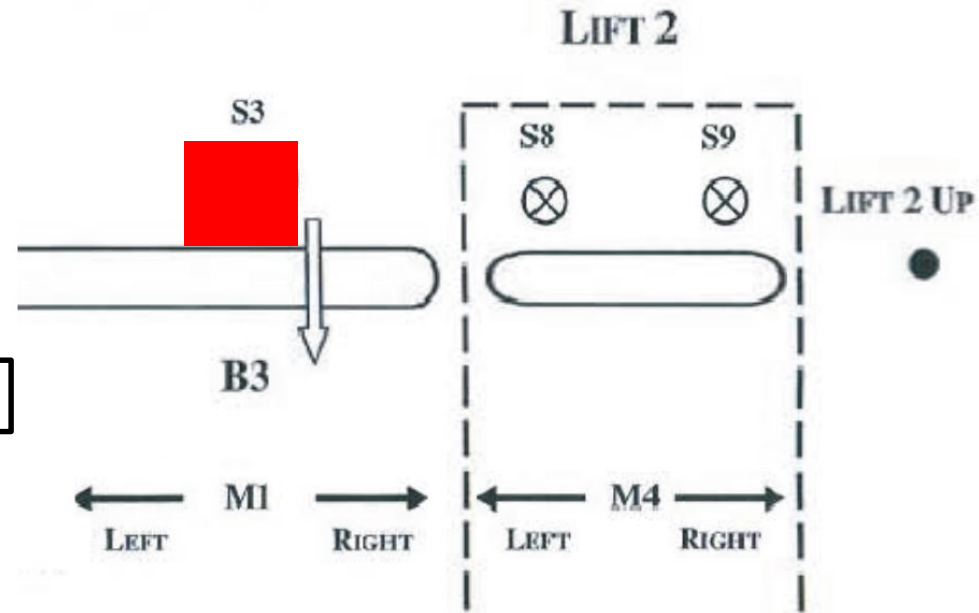
SUBPROGRAM_2

SEND SIGNAL:

lift2_ready

RECEIVE SIGNAL:

load_job



Task 2.a: Separating jobs (1)

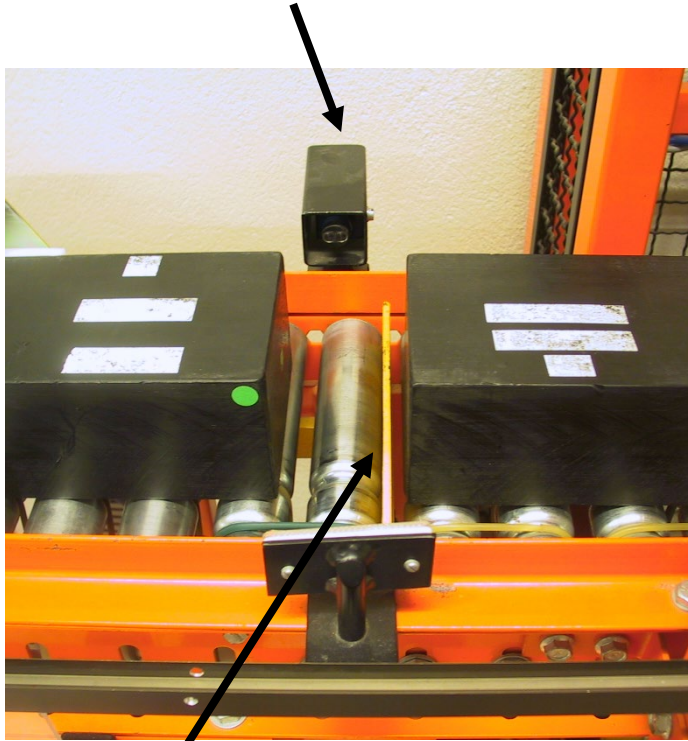


Photocell S3

Block B3

Task 2.a: Separating jobs (2)

Photocell S3



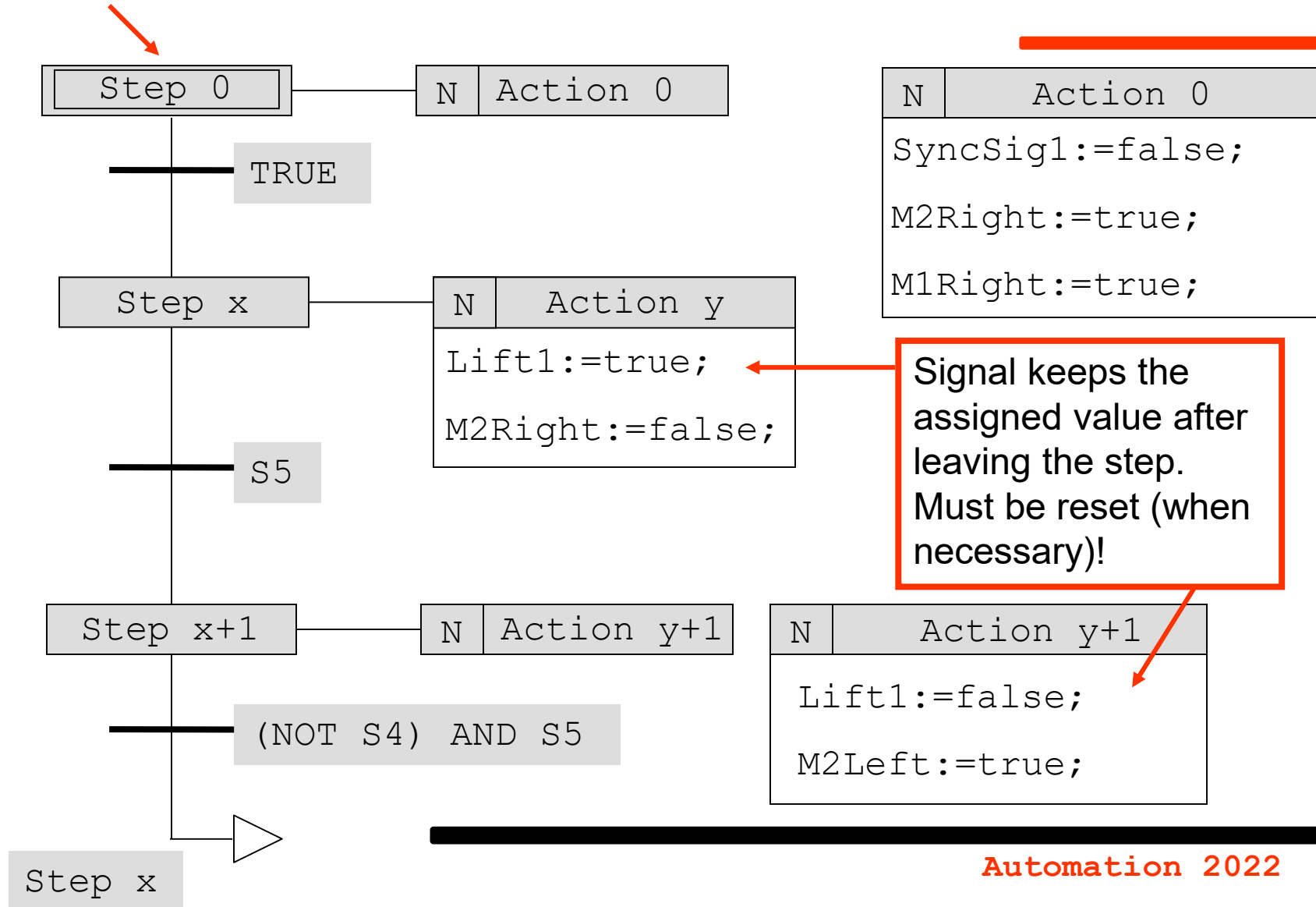
Block B3

The part of transport band **M1** on the right side from block **B3** is rolling faster than **M1** on the left side of **B3** and therefore a gap between two consecutive jobs is created.

WHEN sensor **S3** becomes true (no job in front of it), block **B3** can be raised to separate jobs.

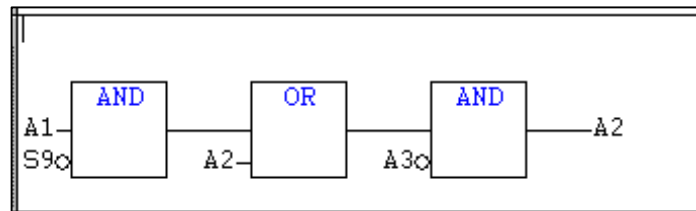
Task 2.a: SFC example

Initial state



Lab 2.b

- Use the same logic as in Lab 1a but implement it in FBD
- Use AND and OR Function blocks to replicate the functionality achieved in LD
- Having a copy of Lab1a implementation or state graph can be handy



IMPORTANT!

Before the lab...

- Read the lab manual.
- Outline five SFC programs, on paper, that will run the conveyor:
 - 1 Scheduler
 - 4 Programs for the sub-processes
- Make a list of the synchronisation variables that will be used for communication between the scheduler and the different programs.
- Remember to use “hand-shaking”

IMPORTANT!

Before the lab...

- Lab2 from Feb 21st to Feb 23rd
- 10 students per session in groups of 2.
- Doodle link for lab booking:
https://doodle.com/poll/257umeygs3q4ys92?utm_source=poll&utm_medium=link
- Lab location: Norra Apparathallen, M-Huset (directions in course website)