



Inspiring Motion

Since 1988

Programming Languages

Sequential Flow Chart (SFC)

Programming Languages

Sequential Flow Chart (SFC)

➤ Step state

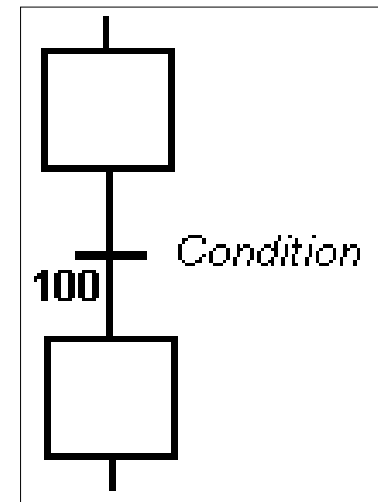
- A step is either active or inactive. The step activity can be used in program expressions:
 - GSnnn.X (is a BOOL expression)
- A step represents a stable state of the process. The duration of step activity can be used in expressions:
 - GSnnn.T (is a TIME expression)

Programming Languages

Sequential Flow Chart (SFC)

> Transitions

- > A transition is represented as horizontal line that crosses a vertical line drawn from a step to another.
- > The default direction for vertical links is from the top to the bottom.
- > Each transition of a SFC program is identified by a unique number.
- > A condition is associated with each transition. The condition is a BOOL expression.
- > If no condition is entered, it is assumed as always TRUE.



Programming Languages

Sequential Flow Chart (SFC)

> Crossing a transition

> A transition is crossed when:

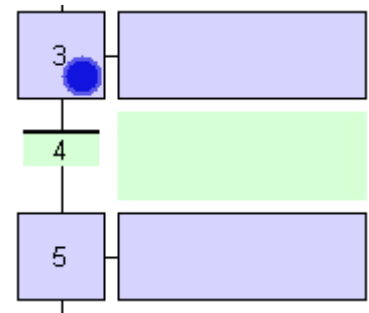
- > All steps linked before the transition are active AND
- > The condition of the transition is TRUE.

> When a transition is crossed:

- > All steps linked before the transition are de-activated
- > All steps linked after the transition are activated.

> Important note:

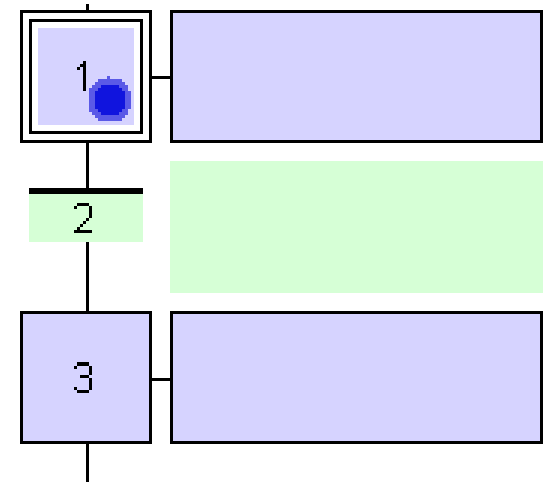
When the same step is linked before and after the transition, it remains active (no pulse in its activity signal)



Programming Languages

Sequential Flow Chart (SFC)

- Describing how it works:
 - The chart must have an initial stage. It shows the state of the process when the application starts.
 - The initial stage is represented by initial step(s) drawn with a double line border.
 - The transitions and their condition describe how the SFC situation changes.
 - Each active step is marked with a small circle (token).



Programming Languages

Sequential Flow Chart (SFC)

➤ Runtime execution

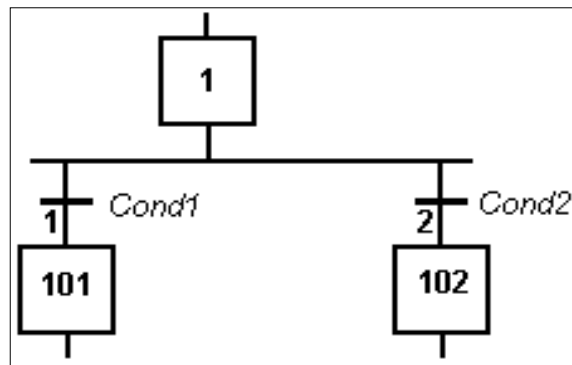
- The following steps are performed at each cycle and for each SFC:
 - Evaluate all valid transitions (transitions following active steps).
 - Execute all active steps in the order of the graph
 - (from top to bottom and left to right).
- If several consecutive transitions are TRUE in a branch, only one is crossed in the target cycle.

Programming Languages

Sequential Flow Chart (SFC)

➤ Divergences

- Several transitions may be linked after the same step. The divergence represents several possible changes of the SFC situation, according to the condition of each transition linked after the step.
- Conditions of a divergence are evaluated using the default priority, from left to right.

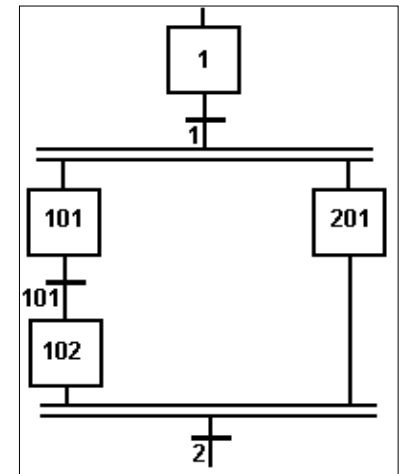


Programming Languages

Sequential Flow Chart (SFC)

➤ Parallel branches

- Several steps can be linked after the same transition. Branches linked after the transition represent parallel processes.
- All parallel branches must finish with a link to the same transition (convergence).
- Parallel divergences and convergences are represented by double horizontal lines.
- In order to avoid blocking situations, there should be no link between branches and outside the divergence.



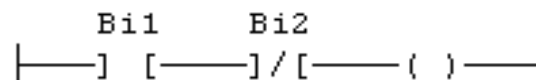
Programming Languages

Sequential Flow Chart (SFC)

➤ Conditions

- Each SFC transition must have a condition to indicate whether the transition can be crossed. The condition is a BOOL expression that can be programmed either in ST or LD language.
- In ST language, enter a BOOL expression. It can be a complex expression including function calls and parenthesis.
For example: `bForce AND (bAlarm OR min (iLevel, 1) <> 1)`
- In LD language, the condition is represented by a single rung. The coil at the end of the rung represents the transition and should have no symbol attached.

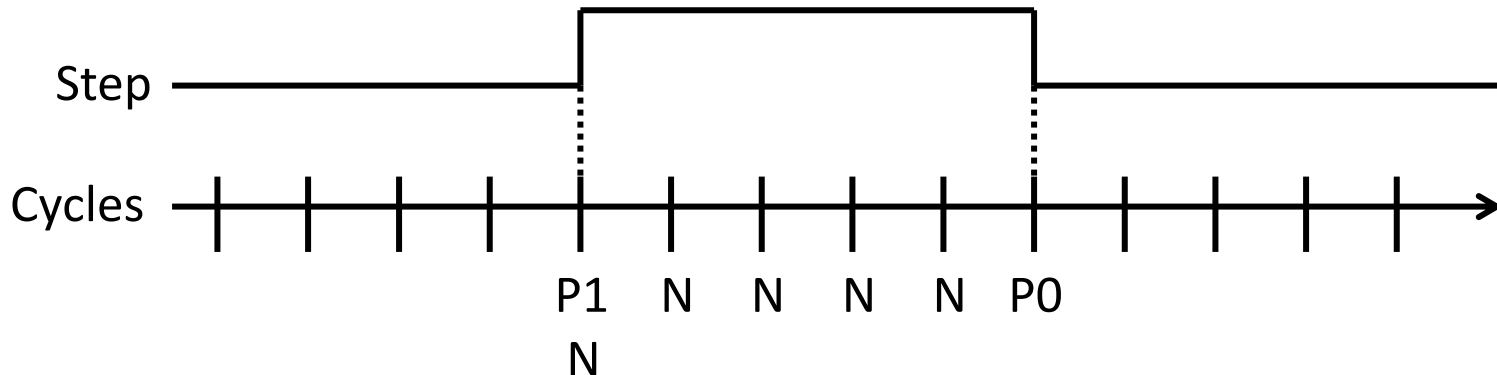
For example:



Programming Languages

Sequential Flow Chart (SFC)

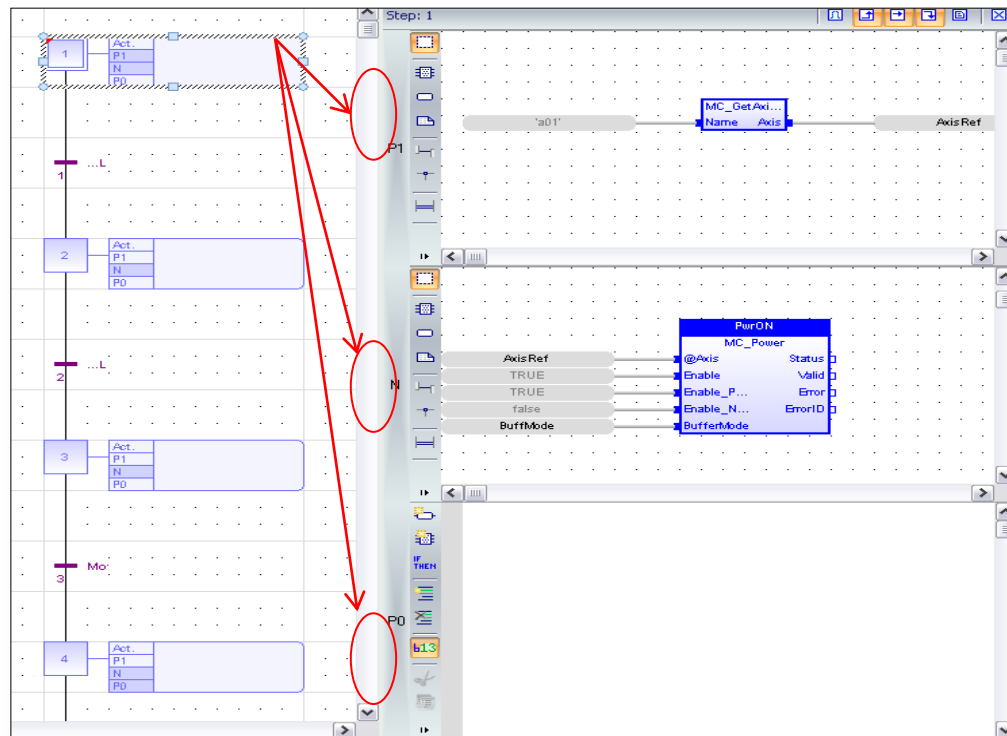
- Actions within a step
 - Actions can be attached to a step. The execution of the action depends on the action qualifier:
 - “P1”: Once when the step becomes active
 - “N”: On each cycle while the step is active
 - “PO”: When the step becomes inactive



Programming Languages

Sequential Flow Chart (SFC)

➤ Actions within a step





Inspiring Motion
Since 1988



Thank You!

www.elmomc.com