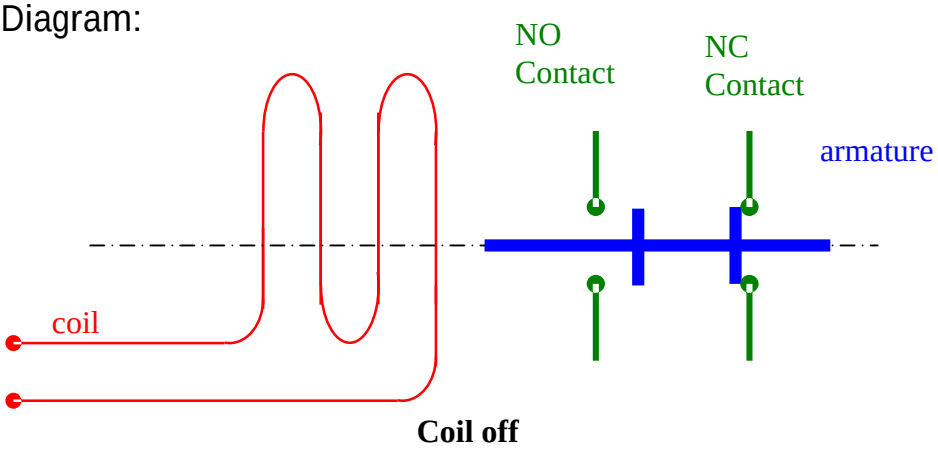
PLC Ladder Basics

Analogy between electromagnetic relays and Ladder diagrams for a PLC

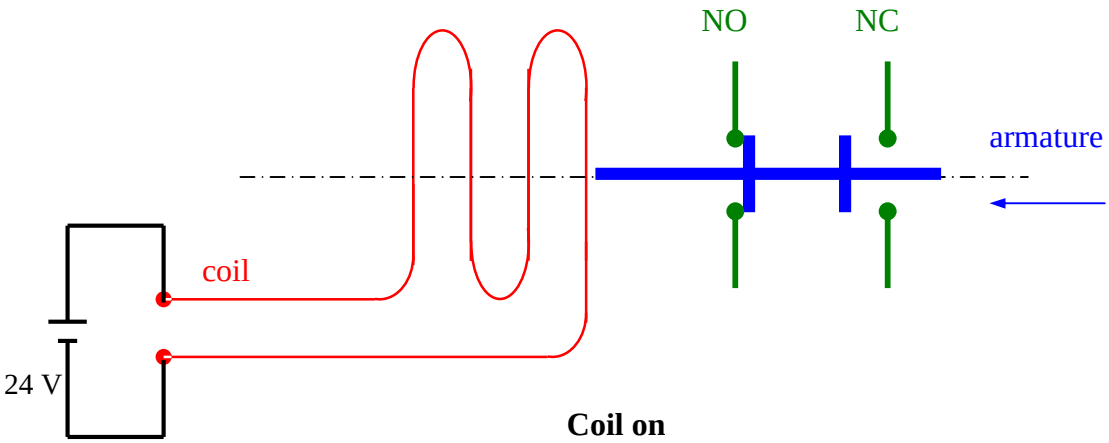
Electromagnetic Relays

It consists of a coil that when it is energized it attracts the armature, causing a Normally Open (NO) switch to close it, and a Normally Closed (NC) switch to open it.

Simplified Diagram:



Coil off



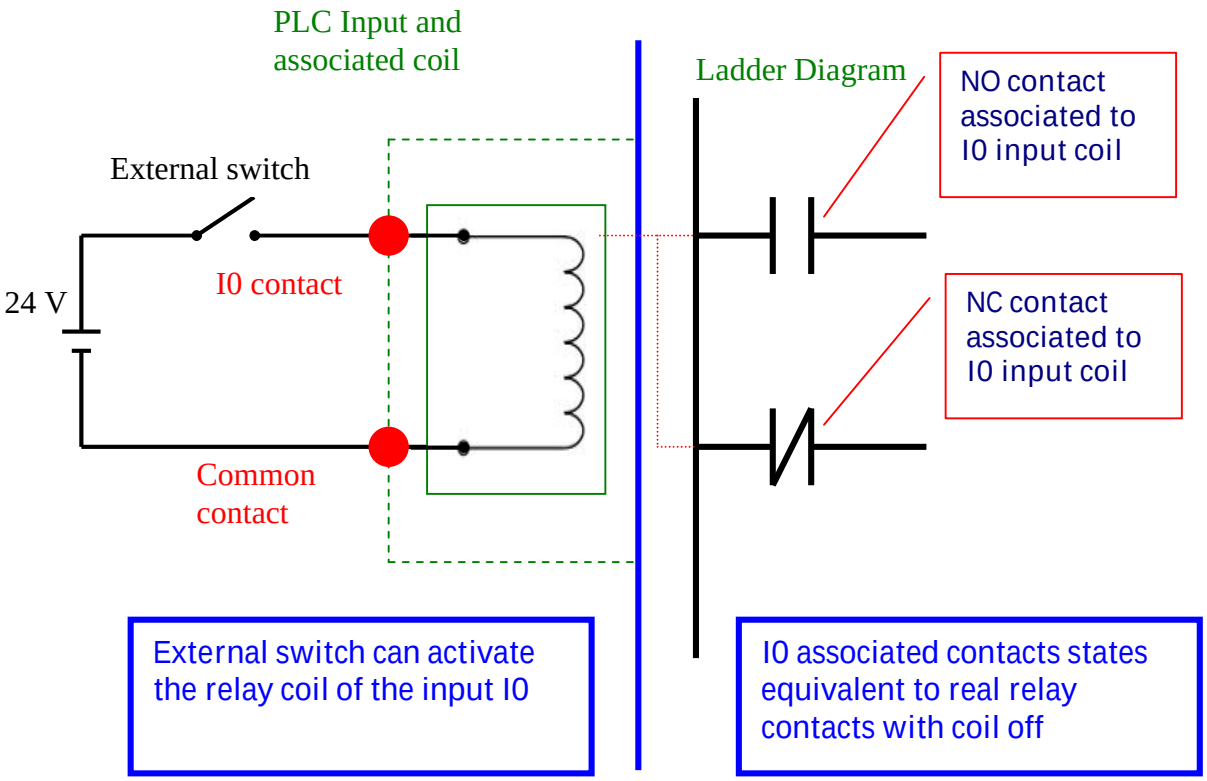
Coil on

Contactos de un PLC

El PLC surge para reemplazar la lógica cableada de un tablero de relés o contactores. Estos tableros son muy usados para controlar procesos complejos con la gran desventaja de la falta de flexibilidad. Una vez que los relés son cableados, un cambio en la secuencia de control implica remover todas las conexiones con la consiguiente pérdida de tiempo y dinero.

El PLC dispone de una serie de contactos asociados a las entradas, las salidas y a sus relés internos, con los cuales se puede resolver un problema de control de forma similar a como se hace con lógica cableada. La programación de un PLC se hace generalmente con Lógica o diagramas Ladder, llamados en castellano literalmente diagramas de escalera, y más técnicamente diagramas de contactos. El concepto de programación con lógica ladder es similar al utilizado en lógica cableada.

En el ejemplo siguiente se verá como se asocia una entrada física de un PLC con los contactos usados en el diagrama ladder. Este concepto puede extenderse a las salidas del PLC y a sus relés internos.



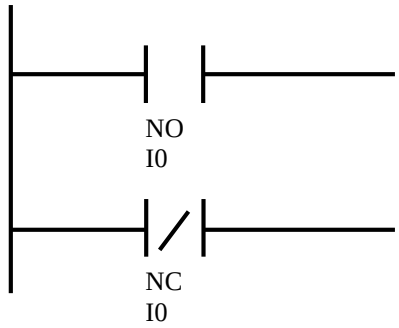
INSTRUCTIONS

PLC instructions are equivalent enough to replace circuits built with physical relays.
In general, every instruction have an equivalent diagram to draw in a ladder diagram.

LOD (Load) and LODN (Load Not):

These instructions are used for reading an Input (I0 in this case) as a Normally Open (NO) and Normally Closed (NC) respectively. In the diagram they appear from the left vertical bar. These symbols apply to inputs (I), outputs (Q) and marks/memories (M). Marks/memories are considered internal relays that have no physical connection outside the case of the PLC.

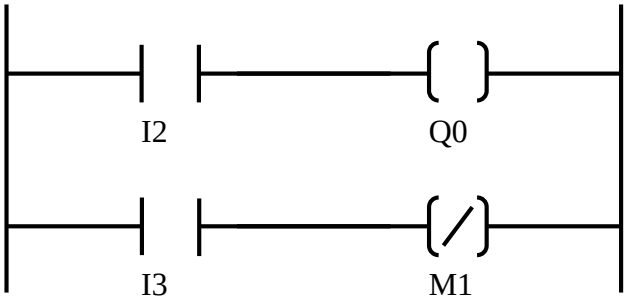
Ladder Diagram:



OUT (Output) and OUTN (Output Not):

These instructions are used for writing an Output (Q0 and M1 in these cases) as a Normally Open (NO) and Normally Closed (NC) respectively. In the diagram they appear from the right vertical bar. These symbols apply to outputs (Q) and marks/memories (M). Marks/memories are considered internal relays that have no physical connection outside the case of the PLC. An Output acts as a relay coil.

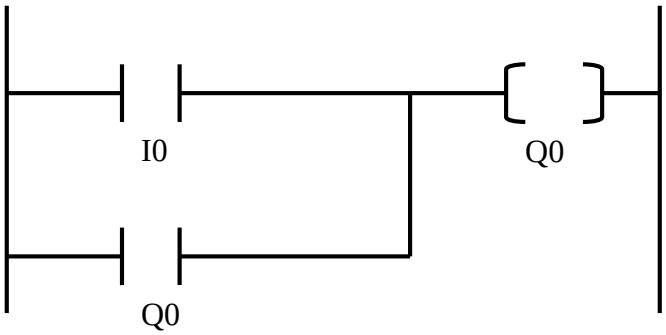
Ladder Diagram:



Feedback:

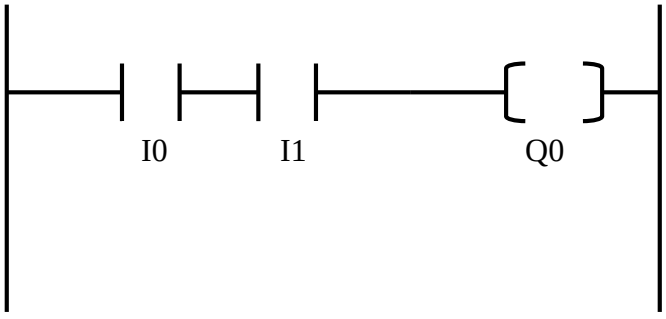
Every Q and M could be feedback in its own circuit. It is equivalent
Se puede realimentar el estado de un relé interno de salida, marca o registro mediante el uso de sus contactos auxiliares internos como entradas.

Ladder Diagram:



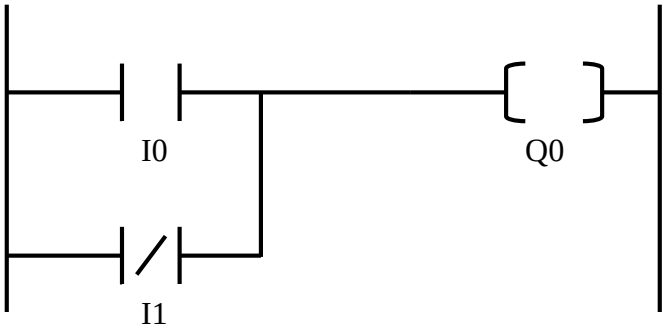
Inputs serial association

Ladder Diagram:



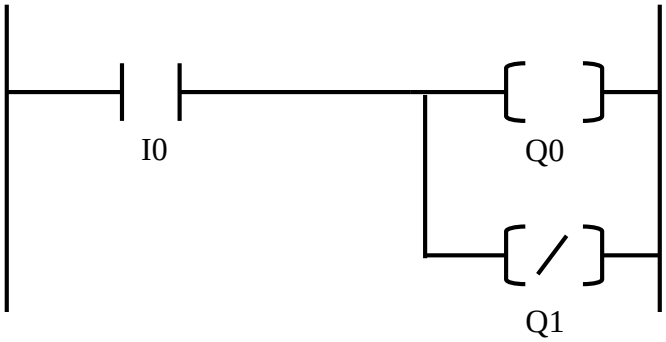
Inputs parallel association

Ladder Diagram:



Outputs parallel association

Ladder Diagram:



Start/Stop Circuit

This is the simplest control circuit for automation of an output.

Ladder Diagram: