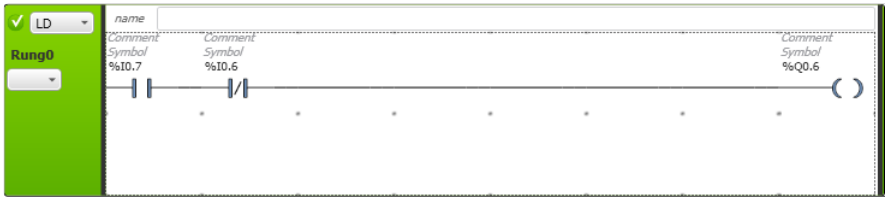
Links

Links are often created automatically when objects are placed in a rung. The link is usually correctly placed but there will be times when the link must be changed.

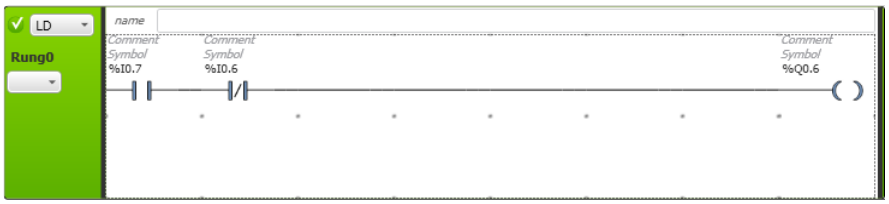


For example, when the output coil is drawn in the above rung, the link between the last contact and the coil is drawn automatically.

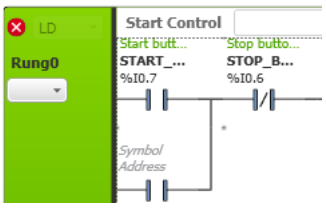
There are two modes when placing a contact, normal mode and branching mode. Normal mode will simply place the object in the rung; branching mode will place the object in the rung and attempt to draw the links to existing contacts.

Automatic Links

If Branching Mode is selected, any contact drawn on the screen adjacent to another contact already in the rung, will be linked to that existing contact.



For example, if a new contact is placed under the normally open contact in the above rung, the links will be drawn automatically.



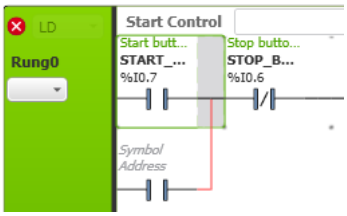
If the contact is not placed adjacent to another contact, the branches will have to be drawn manually. Links will also have to be redrawn manually if they are incorrectly placed by the automatic process.

Programming Rungs (cont.)

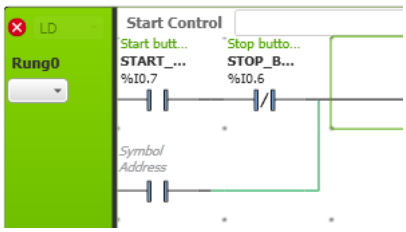
Manually Drawing Links

There are two tools to allow links to be drawn or erased. These are the draw line tool and the erase line tool.

The Erase Line tool will allow lines or links to be erased anywhere in the rung, except where another object has been placed. They are erased by dragging over the line or link to be erased. The line will appear red as it is being erased.



The Draw Line tool will allow lines or links to be drawn anywhere in the rung, except where another object has been placed. The line will appear green as it is being drawn.

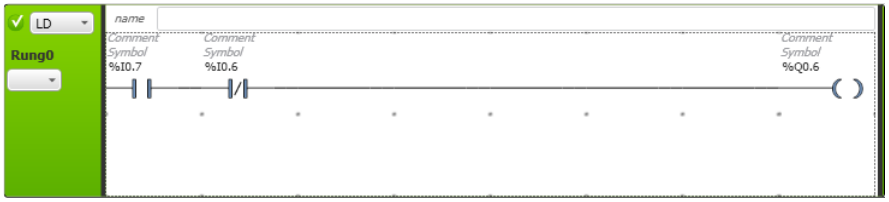


Programming Rungs (cont.)

Power Flow

A way of analysing ladder logic is to imagine power flowing through the contacts. If a contact is closed then power will flow through it and on to the next contact or coil.

In the following example, the normally closed contact will allow power to flow through but this does not answer the question of whether the output coil will turn on. Imagining power flow along the rung allows the rung to be analysed.

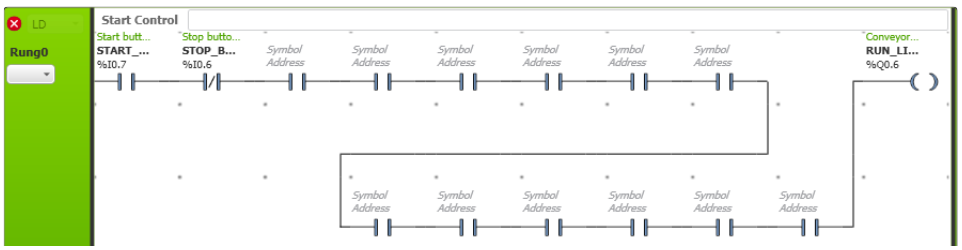


If the first contact is closed, ie input %I0.7 is true, then power will be applied to the left hand side of the normally closed contact. If the second contact is closed, ie input %I0.6 is false, then the power will be applied to the left hand side of the coil allowing it to turn on.

More complex rungs require more complex analysis but this concept of power flow and whether there is power at a certain point in the rung, remains the same. Thus any rung can be "solved" to see whether the output will turn on.

Reverse Power Flow

In the following example, there is a point in the middle of the rung where power flows from right to left instead of from left to right. This is known as Reverse Power Flow. The following shows an example of reverse power flow where power must flow back to the start of the second row of contacts.



Some programming packages allow reverse power flow when a rung is configured. However SoMachine Basic does not allow reverse power flow so care must be taken to avoid this when configuring a rung.

Program errors will be present if this is configured in SoMachine Basic.

Programming Rungs (cont.)

Start Control

The first section of the program will be responsible for Start Control. The start control will simply start all three conveyors at the same time.

In practice timers are often used to provide a staggered start to space out product and prevent current surges. Timed control of the conveyors will be performed as part of the stop control where it is much more important to clear product from the conveyors.

Exercise - Create the Start Control Program

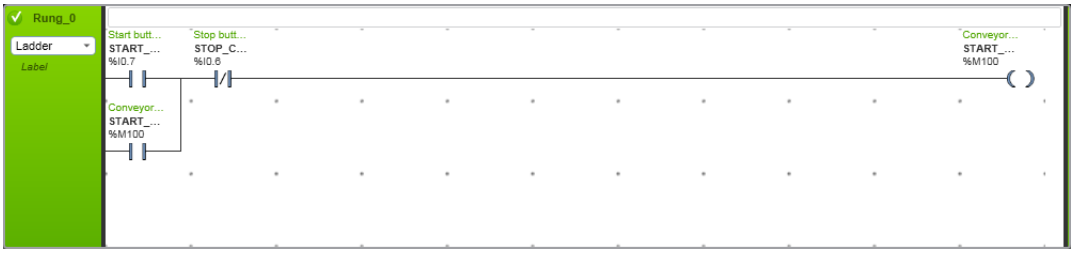
Learning Outcomes

By the completion of this exercise you will:

- Be able to use copy and paste to create program rungs

1 Modify the start control rung.

i. Click the descriptor for the coil and change the address from %Q0.6 to %M100. Similarly, change the descriptor for the latching contact to %M100

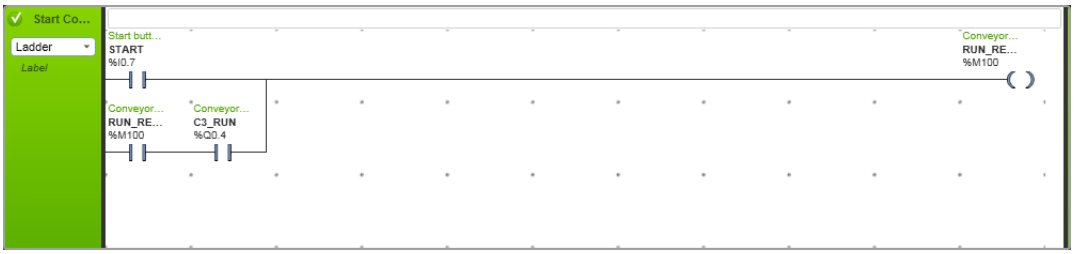


ii. Delete the Stop contact - this will be implemented in a different way as a controlled shutdown is required.

iii. Add two normally open contacts on the second row of the rung.

iv. Select the line drawing tool.

v. Click and hold at the right hand side of the contact at row 2 column 2 and drag the line up to join the top row. The completed rung should look like the following picture



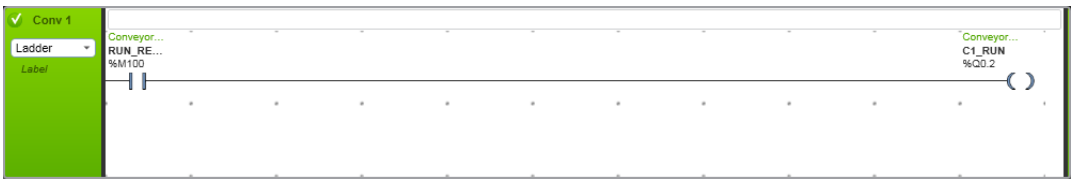
This will complete the change to the start control rung.

Exercise - Create the Start Control Program (cont.)

2 Create the code for conveyor 1.

i. In the rung "Conv 1" add a contact and a coil.

ii. Enter the address %M100 for the contact and %Q0.2 for the coil.



3 Create the code for conveyor 2.

i. Delete the existing **Conv 2** rung

ii. Select the **Conv 1** rung.

iii. Right-click the green area of the rung and select **Copy selected rung** from the menu.

iv. Right-click the empty area below the rung and select **Paste rung** from the menu.

v. Click the address above the coil and change it to %Q0.3.

4 Create the code for conveyor 3.

i. Select the contact and coil from the Conv 1 rung.

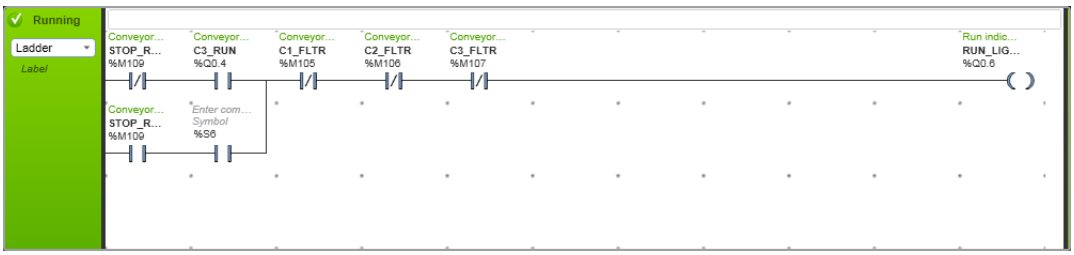
ii. Right-click the green area of the rung and select **Copy** from the menu.

iii. Right-click the green area on the left of the Conv 3 rung and select **Paste** from the menu.

iv. Change the address of the contact to %Q0.4.

5 Create the code for the running indicator lamp.

i. Program the "Running" rung with the following objects



6 Save the application.