Languages

IEC61131

IEC61131 is the international standard for programming PLCs. Its main purpose is to define standard data types and languages. There are many data types that will be discussed later, but there are only five programming languages:

- Ladder Diagram (LD)
- Function Block Diagram (FBD)
- Structured Text (ST)
- Instruction List (IL)
- Sequential Function Chart (SFC)

Of these languages, only Ladder Diagram and Instruction List are currently supported by SoMachine Basic although other languages are planned for future releases.

Ladder

Ladder is a popular programming language as it is similar to electrical diagrams and visually, it is very easy to see what the program is doing. With the addition of in-line status display, it is also very easy to debug.

It consists of a series of program lines or rungs, so called because they look like the rungs of a ladder. To the left of the rung are a set of inputs and conditions that must be solved. To the right of the rung is an object (or objects) defining what to do with the result.

A ladder rung may look something like the following:

```
%I0.0  %I0.1              %Q0.7

--]  [------]  [-----------------(  )--
```

Put simply, if input %I0.0 is on and input %I0.1 is on then output %Q0.7 will turn on. If either of the inputs is off then the output will also be off.

Ladder does have some limitations though. It cannot perform all functions due to limitations in the programming rules and it must be converted to Instruction List before it is processed by the logic controller.

Languages (cont.)

Instruction List

Instruction List is similar to computer machine code and anyone familiar with that will see many similarities. It uses a working store to load and combine values. This store is then written to an output or memory location called an accumulator.

The commands:

```
0001|    LD %I0.0

0002|    AND %I0.1

0003|    ST %Q0.7
```

The three steps are:

Line 1 - Load the value of %I0.0 (0 or 1) into the accumulator

Line 2 - Perform a logical AND of the accumulator with the value of %I0.1 (0 or 1) and store the result back in the accumulator.

Line3 - Write the result (the contents of the accumulator) to output %Q0.7

This is similar to the way a calculator works. The first number is entered (or loaded) at step 1. A mathematical operator such as plus or minus is pressed and another number is entered at step 2; pressing the equals or another operator stores the result back on the display. The result is transferred from the calculator display to a piece of paper at step 3.

This can be written in ladder as:

```
%I0.0  %I0.1              %Q0.7

--]  [------]  [-----------------(  )--
```