IEC 61131-3

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Introduction

- The International Electrotechnical Commission (IEC) committee developed the **IEC 1131 standard** in an effort to standardize programmable controllers.
- Later added 6 to the number: **IEC 61131.**
- New standards IEC 61499 not followed yet.
- One of the committee's objectives was to create a common set of PLC instructions that could be used in all PLCs.

Introduction

- The IEC 61131 standard for programmable controllers consists of five parts:
  1. General information
  2. Equipment and test requirements
  3. Programming languages
  4. User guidelines
  5. Messaging services (communications)

- The IEC 61131 programming language standard is referred to as the **IEC 61131-3 programming standard**

Languages and Instructions

- The IEC 61131-3 standard defines two graphical languages two text-based languages, and one flow-chart language for use in PLC programming.

- *Graphical languages*
  - ladder diagrams (LD)
  - function block diagram (FBD)

- *Text-based languages*
  - instruction list (IL)
  - structured text (ST)

- *Flow-chart language*
  - sequential function chart (SFC).

1. Ladder Diagrams

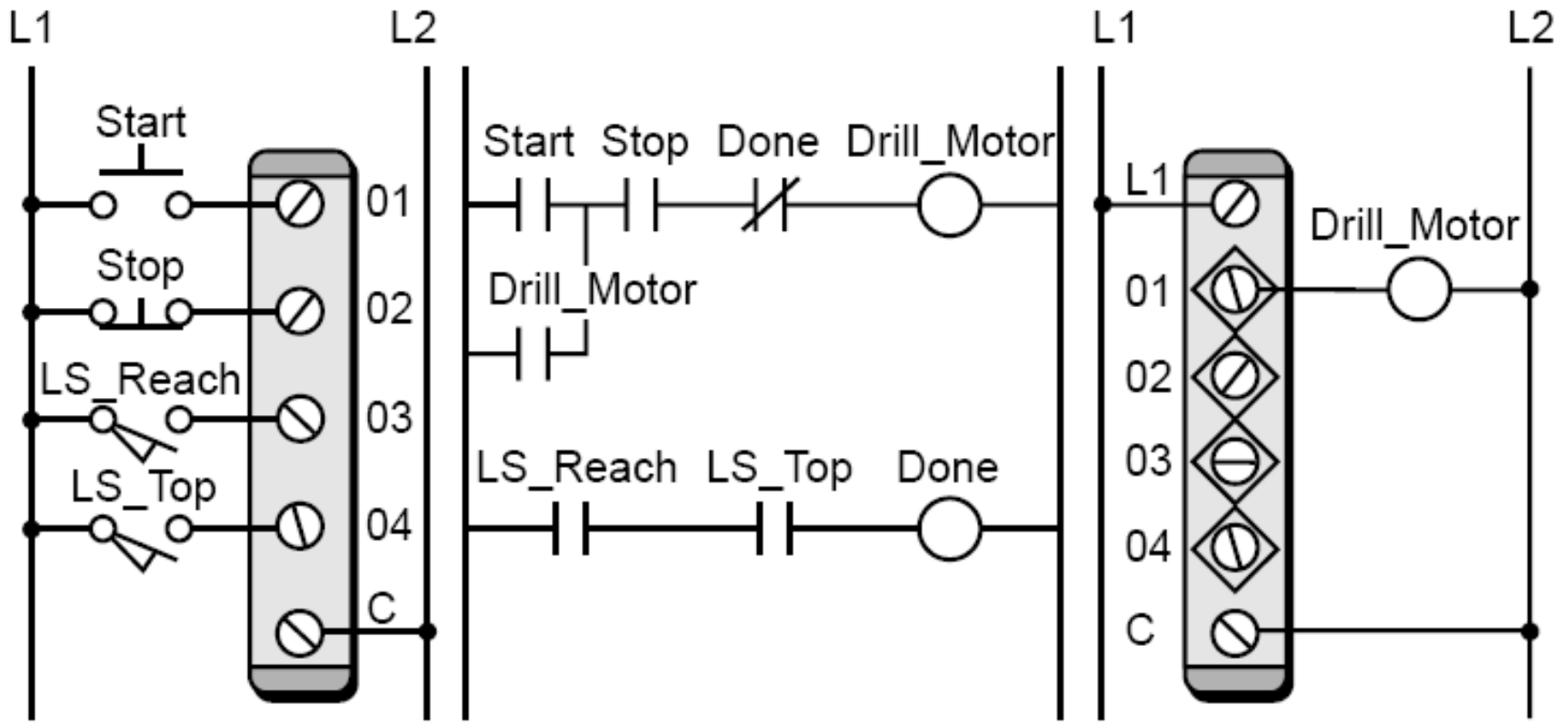
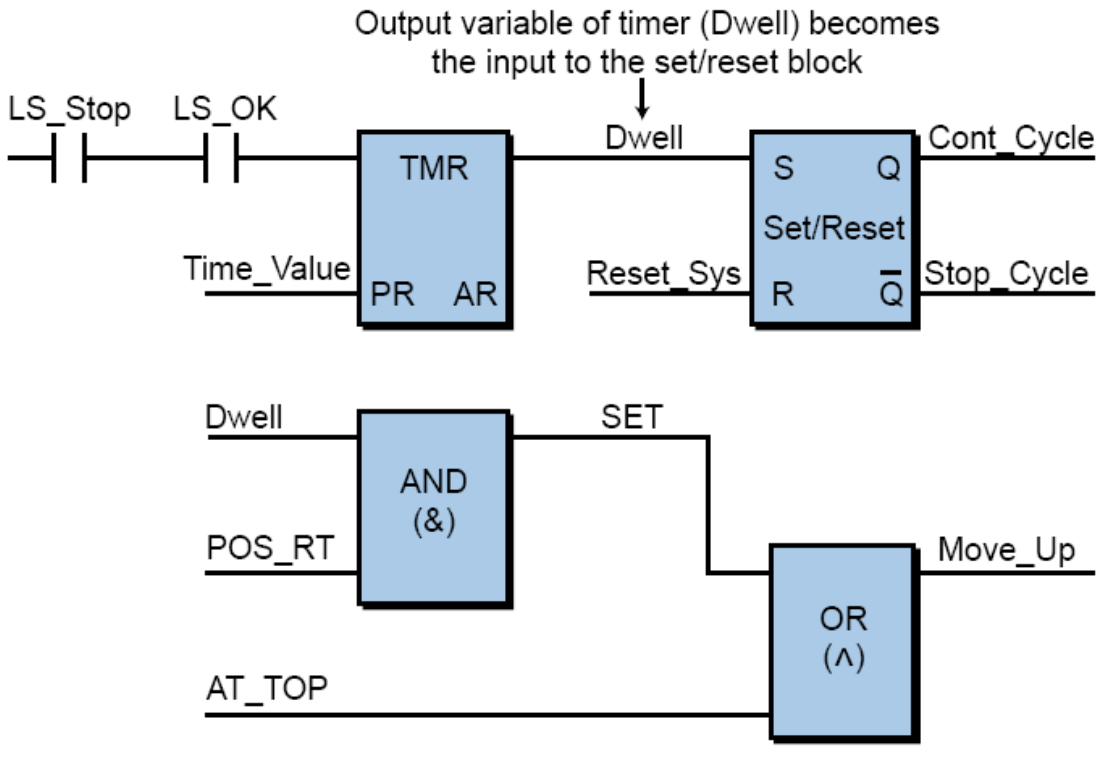


Figure 10-4. Ladder diagram representation of a PLC program.

2. Function Block Diagram



Section of a control program using a timer, set/reset, AND, and OR function blocks

Figure 10-5. Function block diagram language.

3. Instruction List

Instructions		Comments
LD	b1	(*current result:=TRUE*)
AND	b2	(*current result:=b1 AND b2*)
ANDN	b3	(*current result:=b1 AND b2 AND NOT b3*)
ST	b0	(*b0:=current result*)

Note: The current result is held in a result register. The last instruction stores the result register as the variable b0.

Figure 10-10. Example of the machine/assembly language used in microprocessors.

4. Structured Text

```
IF Manual AND NOT Alarm THEN
                Level:=Manual_Level;
                Mixer:=Start AND NOT Reset
ELSE_IF      Other_Mode THEN
                Level:=Max_Level;
ELSE            Level:=(Level_Indic × 100)/Scale;
END_IF;
```

Figure 10-12. Example of a BASIC-like computer program.

5. Sequential Function Charts

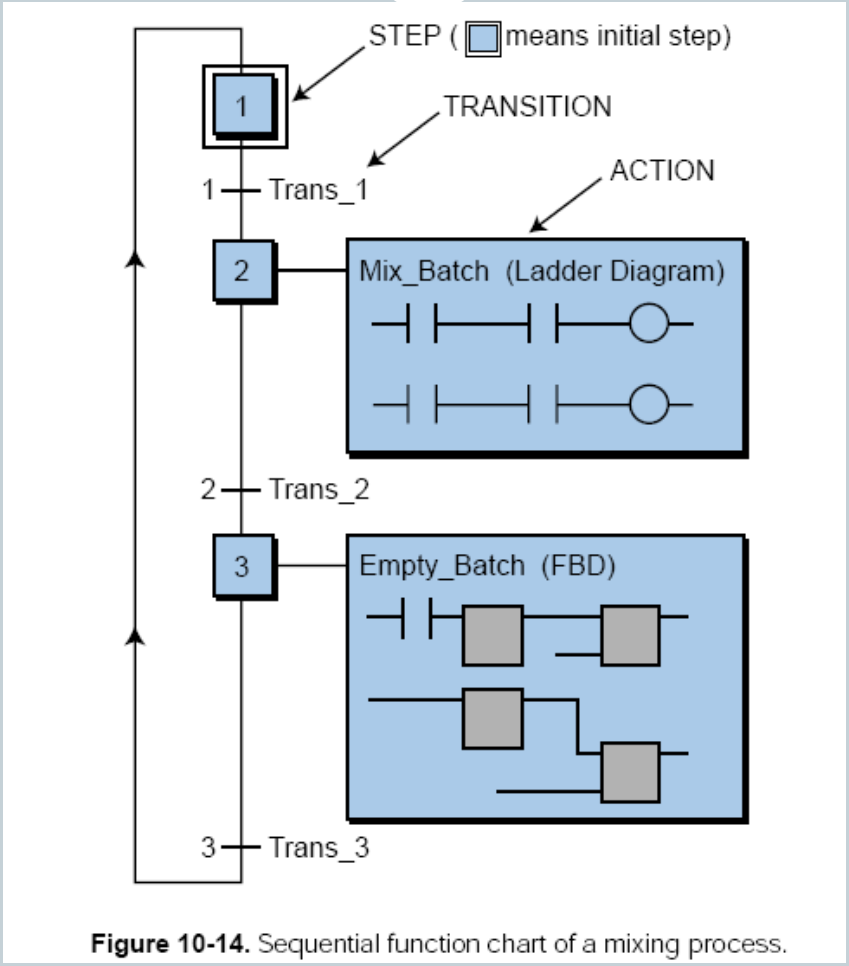
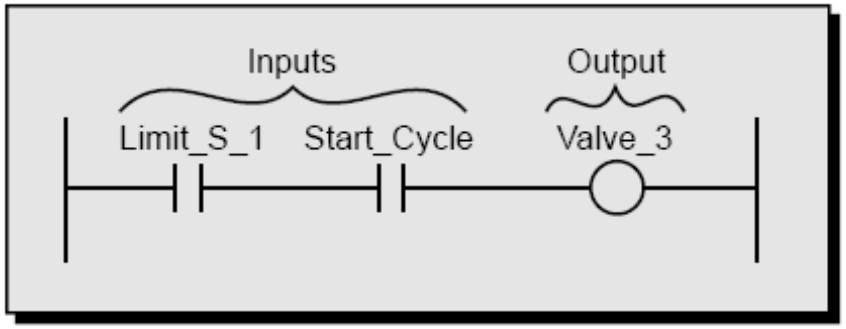
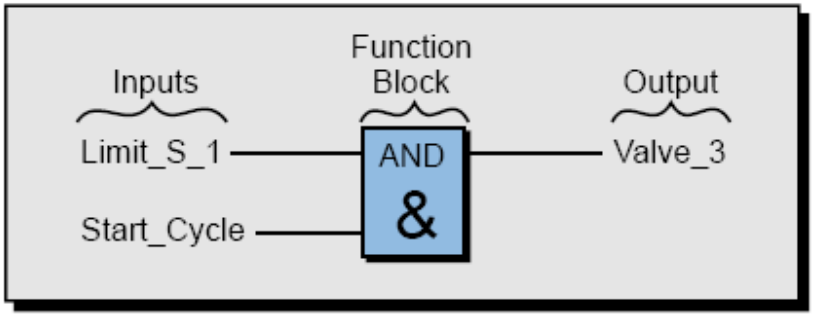


Figure 10-14. Sequential function chart of a mixing process.

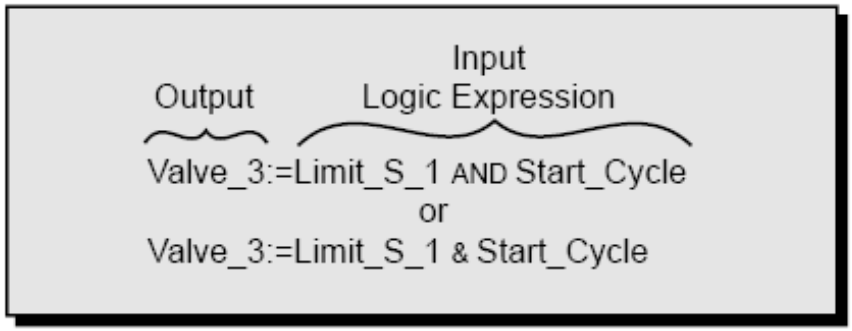
Programming Language Example



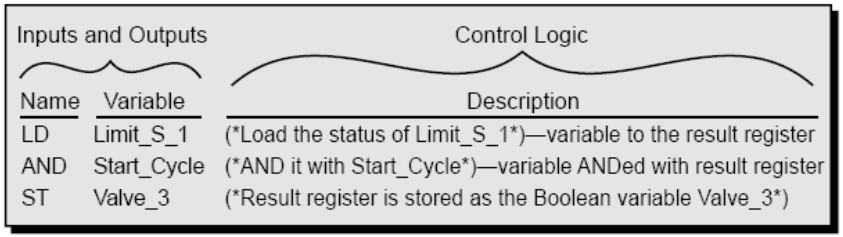
(a) Ladder diagram (LD)



(b) Function block diagram (FBD)



(c) Structured text (ST)



(d) Instruction list (IL)

Summary

- The IEC 61131-3 standard provides PLC users with advantages in both the programming and troubleshooting of a control system.
- PLCs that support the IEC 61131 standard
  - Have better documented programs.
  - Provide immediate benefits to anyone who must troubleshoot the system or modify the program.
- For PLC users and programmers, one advantage associated with the IEC 1131-3 is the option to choose the language for the programming and implementation of the control system.