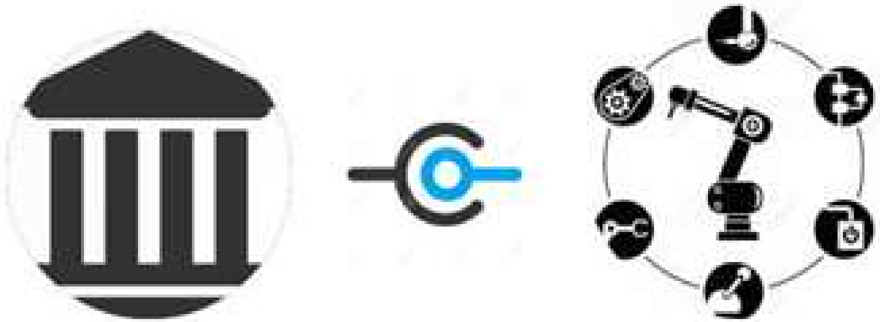
KLS'S GOGTE INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

CREINTORS AUTOMATION SOLUTIONS PVT.LTD.

PRESENTS

HONOR'S PROGRAM IN PLC PROGRAMMING



Syllabus of Course

1. Basic of PLC

2. PLC Programming

3. SCADA Programming

Detail of Syllabus

Unit – I

What is A PLC, Technical Definition of PLC, What are its advantages, characteristics functions of A PLC, Block Diagram of PLC: Input/output (I/O) section, Processor Section, Power supply, Memory central Processing Unit: Different Languages of PLC.

Unit – II

Bit Logic Instructions: introduction: Input and Output contact program symbols, Numbering system of inputs and outputs, Program format, introduction to logic: Equivalent Ladder diagram of AND gate OR Gate, OR Gate, NOT Gate XOR Gate, NAND Gate, NOR Gate. Ladder design, Sinking and sourcing

Case Study - Design Thinking and Execution with practical experiments

Detail of Syllabus

Unit – III

PLC Timers and Counters: Retentive and non-retentive timers. Timer instruction. PLC Counter: Operation of PLC Counter, Counter Parameters, Counters Instructions Overview Count up (CTU) Count down (CTD). Advanced instructions: Introduction: Comparison instructions, discussions on comparison Instructions, “EQUAL” or “EQU” instruction, “NOT EQUAL” or “NEQ” instruction, “LESS THAN” or “LESS” instruction, “LESS THANOR EQUAL’ or “LEQ” instruction, GREATER THAN” OR “GRT” instruction, “GREATER THAN OR EQUAL TO” or “GRO” instruction, “MASKED COMPARISON FOR EQUAL” or “MEQ” instruction, “LIMIT TEST” or “LIM” Instruction. Functional block diagram and sequential ladder diagram.

Case Study - Design Thinking and Execution with practical experiments.

Detail of Syllabus

Unit – IV

PLC input output (I/O) modules and power supply: Introduction: Classification of I/O, I/O system overview, practical I/O system and its mapping addressing local and expansion I/O. Types of Analog input modules, special input modules and Analog output module.

Case Study - Design Thinking and Execution with practical experiments.

Unit –V

SCADA SYSTEMS Introduction, definition of Supervisory Control and Data Acquisition, typical SCADA System Architecture, Communication Requirements, Desirable properties of SCADA system, Features, advantages, disadvantages and applications of SCADA. SCADA Architecture (First generation-Monolithic, Second Generation-Distributed, Third generation-Networked Architecture), SCADA systems in operation and control of interconnected power system, Water Purification System, Hydraulic Test Rig, Power System Automation, Petroleum Refining Process, Chemical Plant.

What is a PLC and when developed?

The first PLC(**P**rogrammable **L**ogic **C**ontroller) was developed by a group of engineers at General Motors in 1968, when the company were looking for an alternative to replace complex **relay control systems.**

PLC are complex and powerful computers. But, we can describe the function of a PLC in simple terms. The PLC takes inputs, performs logic on the inputs in the CPU and then turns on or off outputs based on that logic. The CPU takes the information that it gets from the inputs, performs logic on the inputs.

- Designed for industrial processes.
- Works under severe conditions.
- Real time system.
- Handles sensors and actuators (I/O).

Strengths of PLC

Flexibility: One single Programmable Logic Controller can easily run many machines. ... With PLC control any change in circuit design or sequence is as simple as retyping the logic. Correcting errors in PLC is extremely short and cost effective.

- Reliable. Used for safety systems.
- Robust. Resistant to electrical noise, vibration, impact, dust, heat.
- Extensive range of inputs/outputs.
- Extensive range of functionalities.
- Long term support by suppliers.
- Long life, around 30 years.

Weakness of PLC

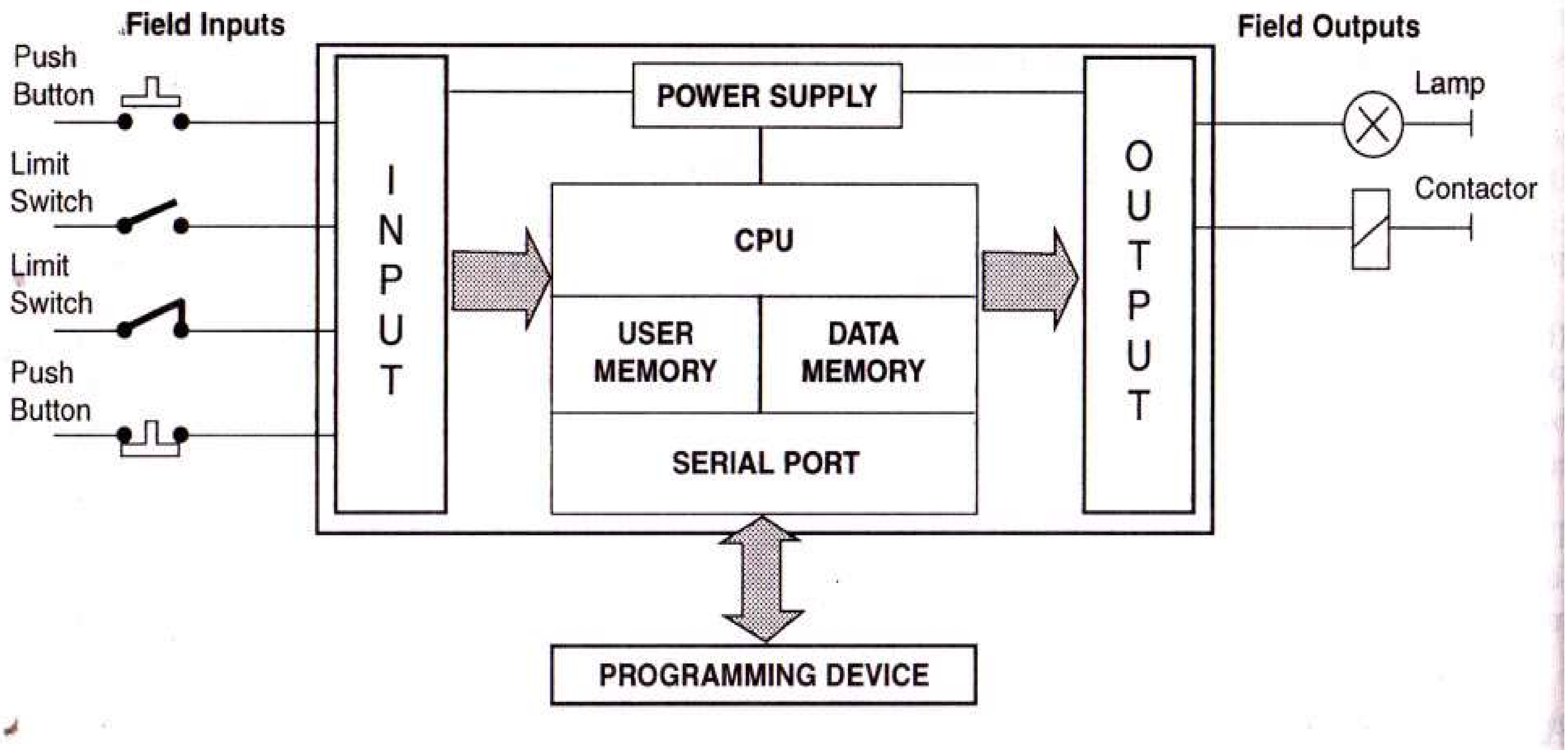
- Special programming environment.
- Different programming languages from different manufacturers.

Advantages of PLC over the Relay logic controller

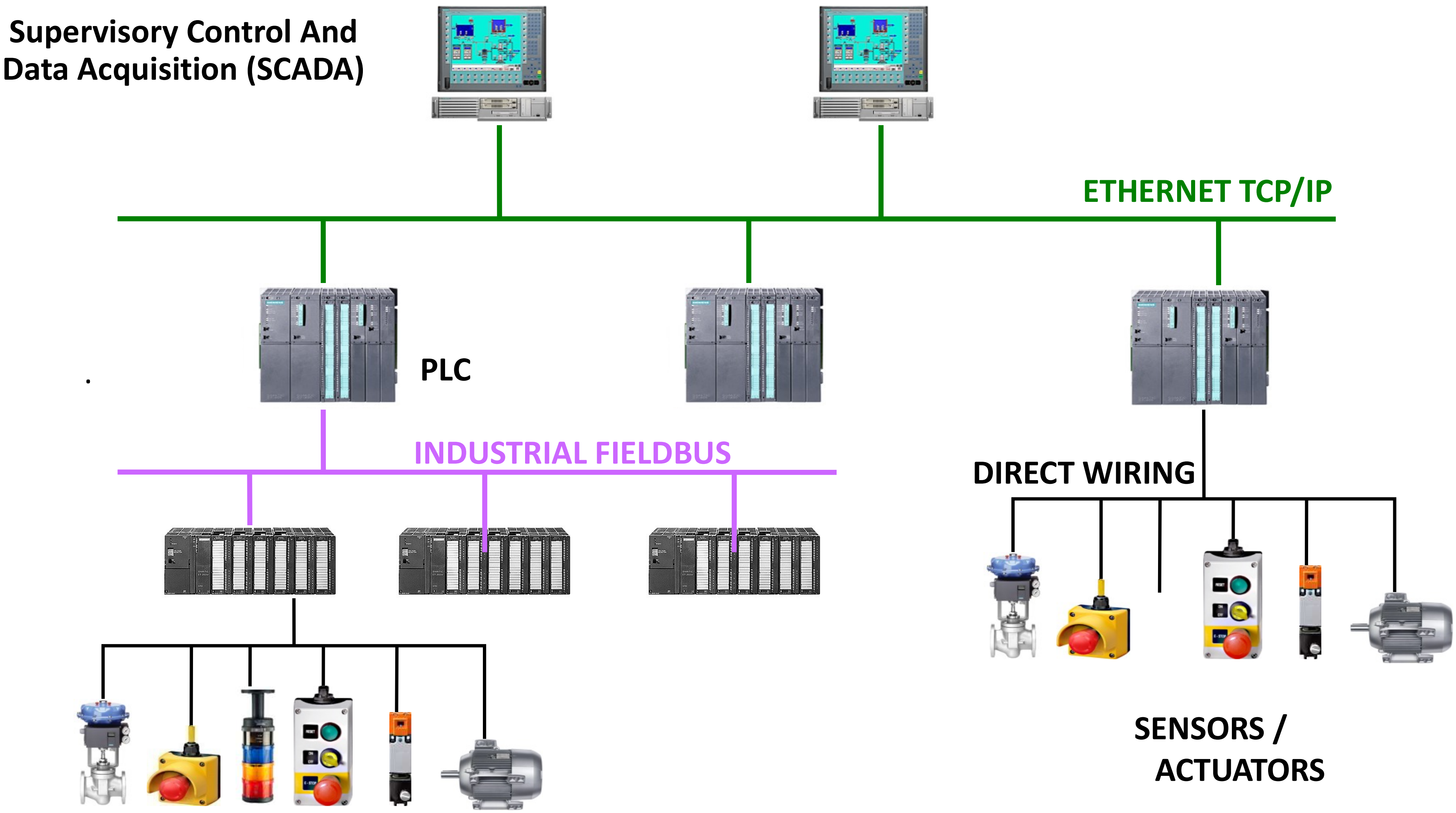
PLCs are programmbale – Many control relays can be replaced by software, which means less hardware failure, – It is easier to make changes in software than in hardware. – Special functions such as time delay actions, counters are easy to produce in software.

Adding Timer and Counter in Relay logic is difficult becuase major problems space constrained, wiring etc.

Block Diagram of PLC



Hardware Overview of PLC



Programming Languages of PLC

Languages defined in IEC 61131-3

1.Textual languages

A. Instruction List (IL)

B. Structure Text (ST)

2. Graphical Languages

A. Ladder (LD)

B. Functional Block Diagram (FBD)

3. Sequence (Stepper)

A. Sequential Function Chart (SFC)

Programming Languages of PLC

1. Textual languages

Instruction List (IL)

- IL: Instruction List
- Fastest possible logic execution.
- Low level language
- Similar to assembly language

```
»»»»»»»»»»»»»»» Instruction List Start ««««««««««««««««
(* example  D = A - (B - C) *)
LD A
SUB ( LD B SUB C )
ST D
»»»»»»»»»»»»»»»»» Instruction List End «««««««««««««««««
```

Programming Languages of PLC

1. Textual languages

ST: Structured Text

- High level language
- Equations, table manipulation
- Complex algorithms (If/Then)

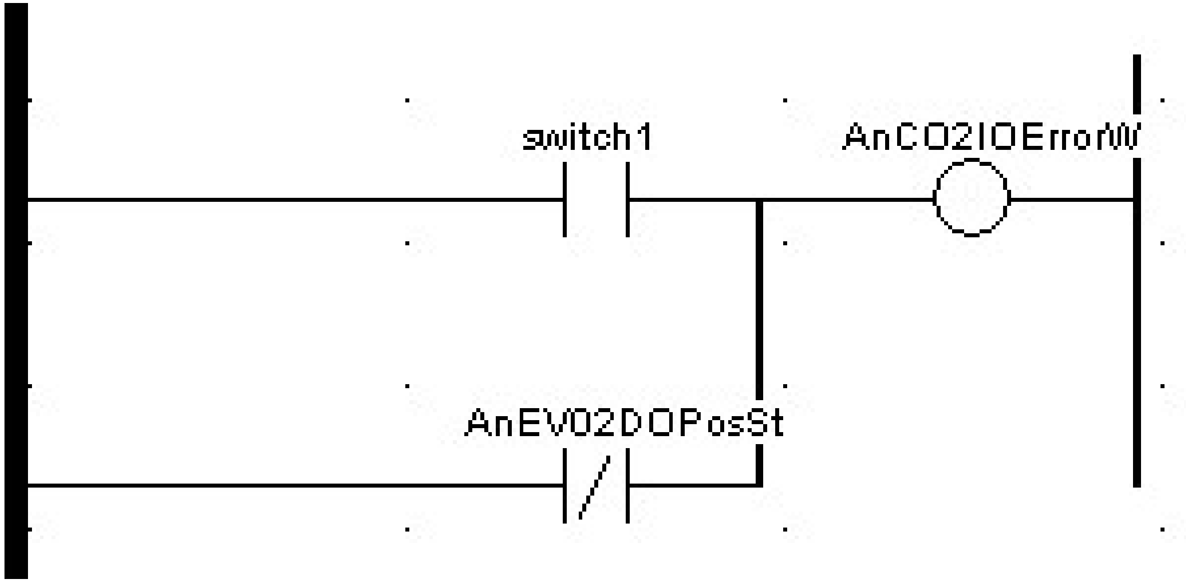
```
(* conditionnal if *)
IF (var1 = 12.45) THEN boolean1 := TRUE;
   else var2 := 56.78; boolean2 := 0;
   END_IF;

(* simple PID controller *)
SIMPLE_CONTROLLER (PV := int_to_real(_integer) , SP := _real/56.78,
                   PARA := para_PID,OUT := PID_Reg,
                   OUTD => Out_PID);
```

Programming Languages of PLC

2. Graphical languages

LD : Ladder Diagram

- *Traditional ladder logic is an easy-to-use graphical programming language that implements relay-equivalent symbol.*

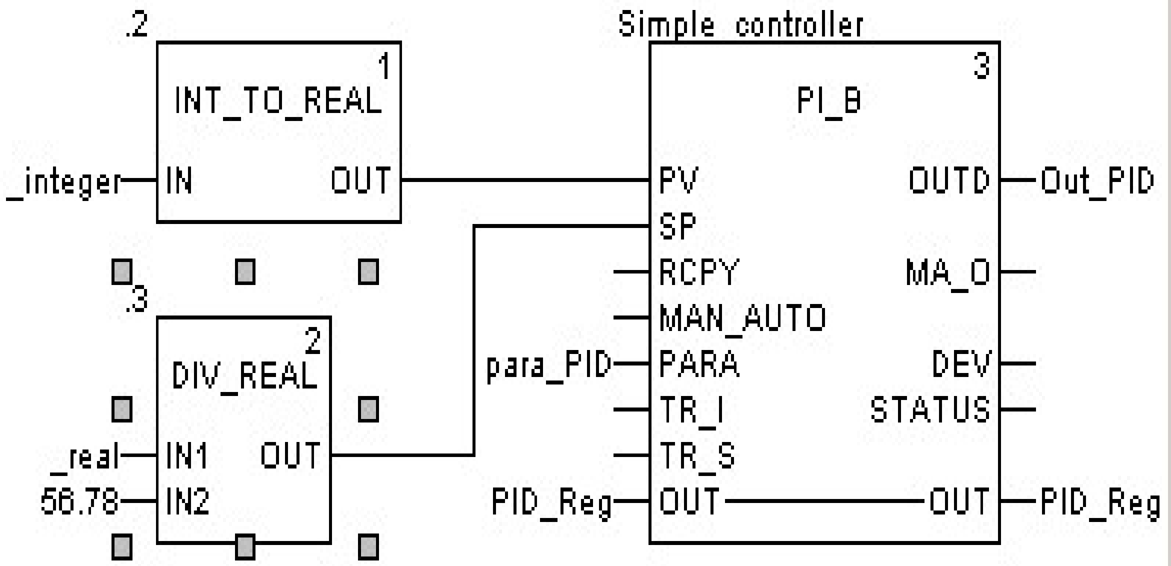


Programming Languages of PLC

2. Graphical languages

FBD - Function Block Diagram

- Easy way of programming
- Easy way of debugging
- Limited for complex algorithms



Programming Languages of PLC

3. Sequence (Stepper)

SFC - Sequential Function Chart

A graphical method of representing a sequential control system (stepper).

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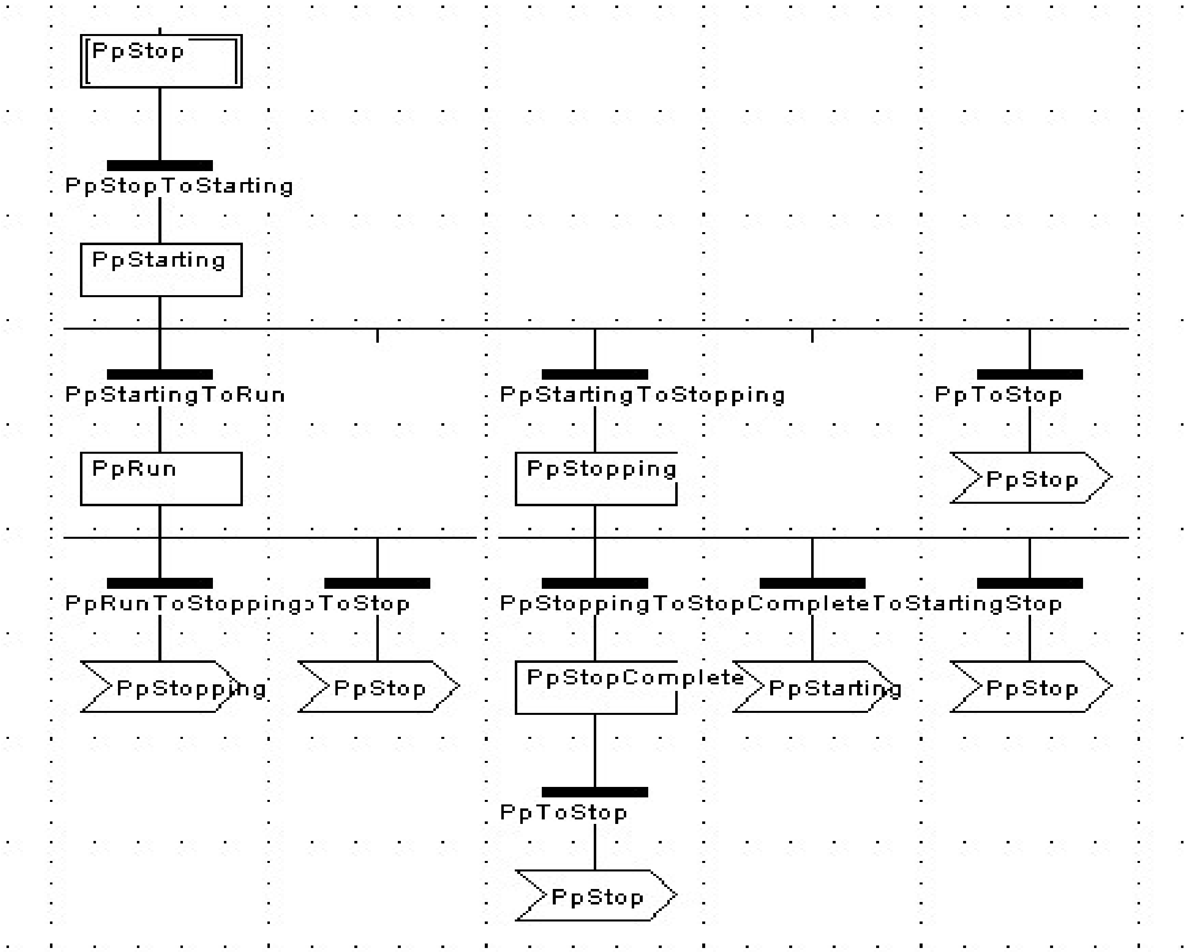


THANK YOU